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Electrical World

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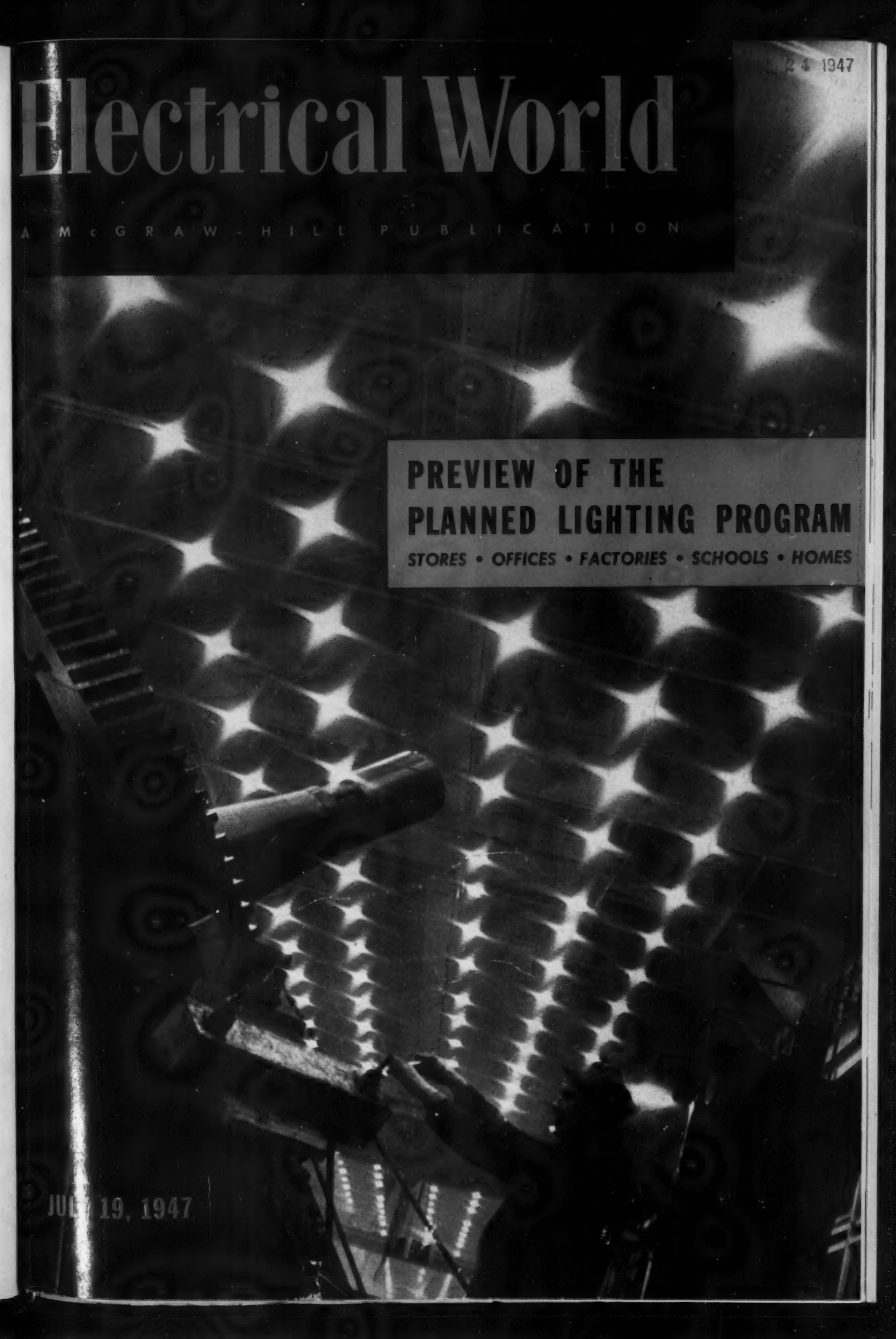
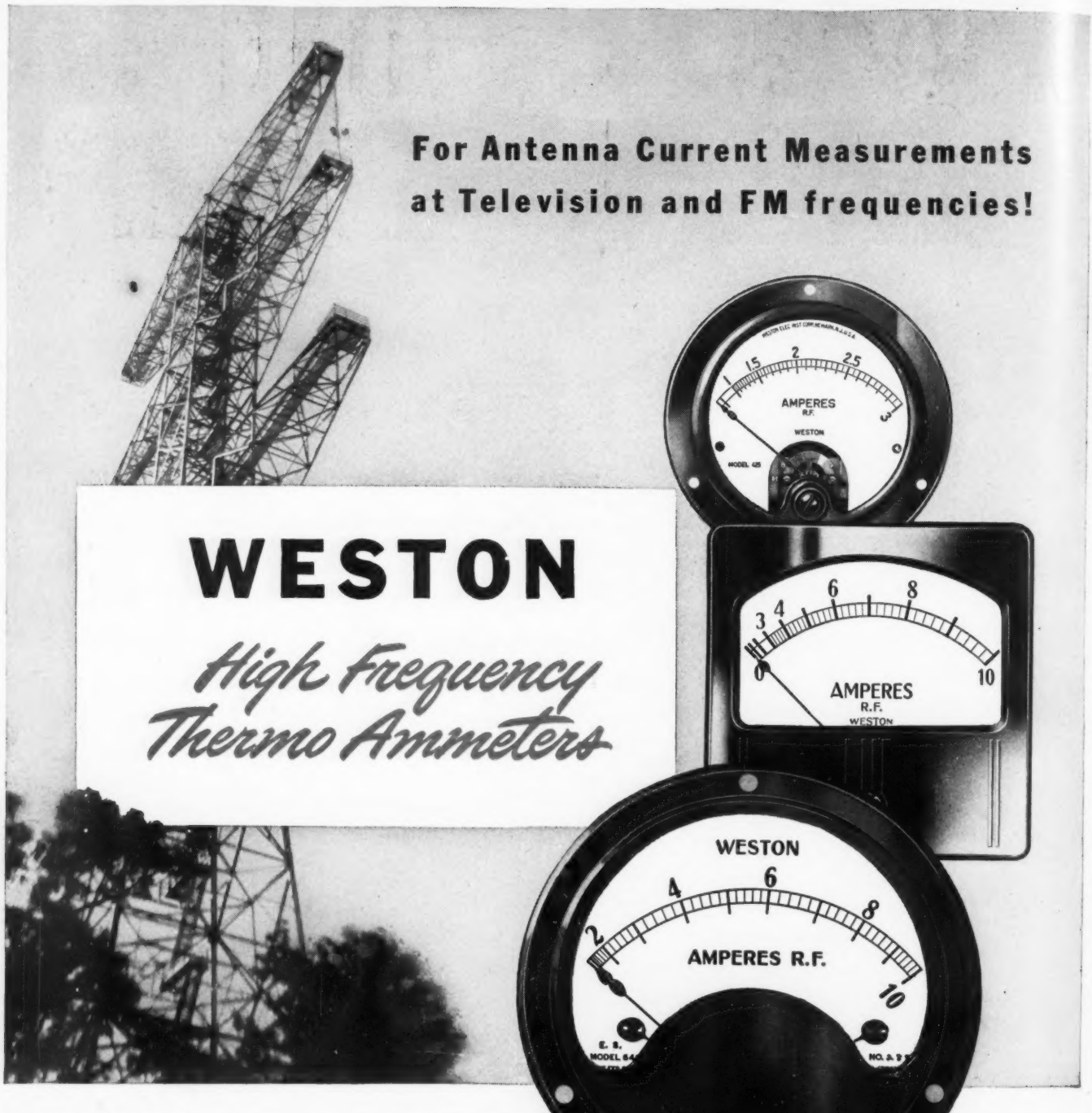


PREVIEW OF THE PLANNED LIGHTING PROGRAM

STORES • OFFICES • FACTORIES • SCHOOLS • HOMES

JUL 19, 1947



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This Week's Cover Picture

Good lighting begins at home in a Westinghouse manufacturing aisle. Interspersed 1,000-watt mercury vapor and 1,500-watt incandescent lamps yield 45 foot-candles of cool blue-white light at work level

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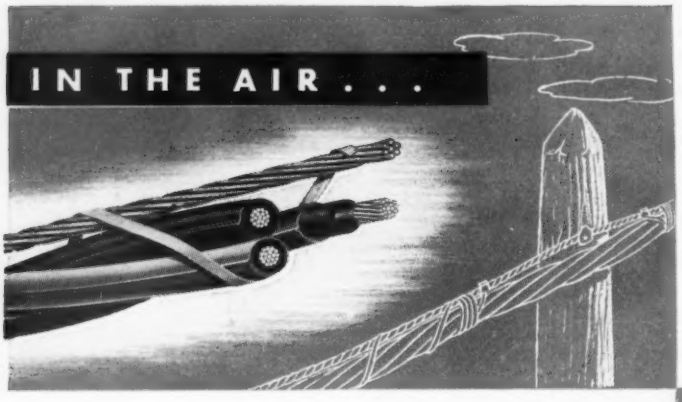

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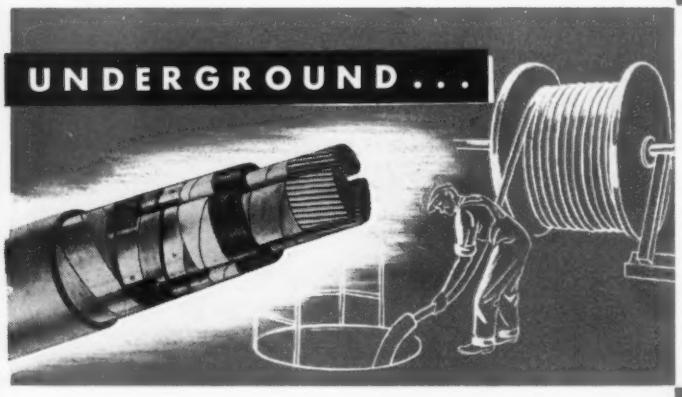

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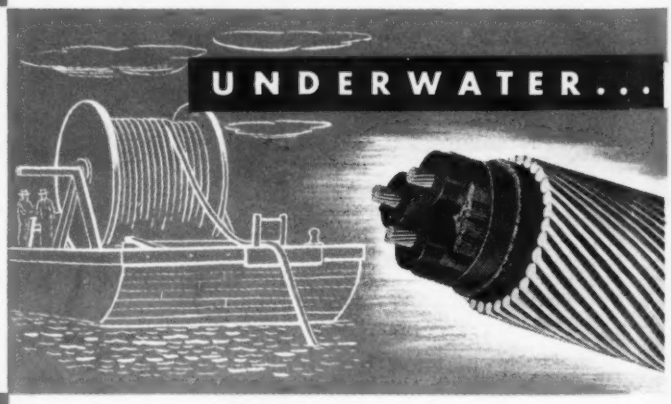
They include cables for Oilostatic Transmission Systems (Voltage: up to 230,000 v.) . . . Oil Filled Cables (Voltage: up to 230,000 v.) . . . Solid Type Cables (Voltage: up to 75,000 v.) . . . and gas pressure cables at various voltages depending on gas pressure.



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Moisture-resistant Okolite insulation on conductors also resists heat and ozone, eliminates the need for lead sheathing—an important saving in weight and cost. A tough steel wire armor, helically wound over a cushion of saturated jute protects against mechanical damage. Voltage: up to 35,000 v.

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Electrical World

JULY 19, 1947

Opportunity and Danger

"CALCULATED RISK" is a term used by military men as they weigh the rewards and penalties of a proposed action. The risk is calculated on the basis of available information and decision is taken according to its promise.

Such a situation now confronts the electric utility industry. On the one hand is a present capacity stringency that says "no" to load-building activity. On the other lie a couple of facts, a possibility and a danger.

The facts are that there has been no load building since 1941 and that it takes time for load-building activities to get rolling and begin to produce. The possibility is that urgent necessity for load building may arise sooner than is indicated by present conditions. The danger is that if action is not taken now in a certain direction, considerable damage to established revenues may occur.

The facts need no discussion. The possibility of a business recession that can turn capacity shortage into surplus is apparent. The danger needs some definition.

No other single use of electricity approaches lighting in revenue significance. Depending on local conditions, at least a third, perhaps two-thirds, of individual electric utility revenues derive from this service.

Lighting revenues were threatened years ago, or were thought to be, by improvements in light sources. When the metal filament and the gas-filled lamps came along, decimation of lighting service dollars was foreseen. But it didn't happen. The increased efficiency of light production caused people to use more light than before and what loomed as threats turned out to be boons.

However, today's new light sources have already shown that they can reduce revenues and will do so if their applications are not intelligently directed. Moreover, if they are not so directed, the user is dissatisfied. Thus the utility is doubly afflicted, suffering first a loss of revenue and then a discontented customer. That is the danger. It is big and real. It won't evaporate of itself as in the previous cases.

In these premises of facts, possibility and danger, the calculated risk for the electric utility is to adopt and actively to carry on the Planned Lighting Program now ready to go and described in this issue of ELECTRICAL WORLD. The program is a way to resume load building after too many years of inactivity. It offers a means for setting up a sales organization that can quickly be expanded when necessary. Its object is as much to prevent loss of lighting load and revenue as to build them up. However bad may be its capacity condition, there are other loads any utility would rather see reduced than lighting. Also, more than any other service, lighting offers promise of necessary revenue increase to pay for the high-cost capacity now being installed. When the risk is calculated, it is seen to be not that at all, but an opportunity.

★ ★ NEWS OF THE

Congress Gets Industry's Stand on Tax Differential

E.E.I., N.A.E.C. Join in Presentation of the Effect of Unequal Taxation Upon Private Electric Enterprise—Joint Study on Electric Energy Tax Laid Before House Group

A BROAD and exhaustive study of the tax differential between publicly owned and privately owned electric power system operation was presented before the House Ways and Means Committee this week by two New York University economists, on behalf of the Edison Electric Institute and the National Association of Electric Companies.

Presented at the same time was a study of the federal 3.3 percent electrical energy tax, which was made public some time ago, prepared by the same authors, Drs. H. B. Dorau and J. R. Foster.

In addition to citing and justifying the tax inequities which have become common knowledge in the power industry, Dorau and Foster cited certain less well-known aspects of the tax situation and considerable data indicating specifically the extent of the inequities.

Consequences of the existing tax situation, they declared, include "piecemeal socialization of the industry," and "an uneconomic development of the electric industry." They asserted that "the capitalized value of the federal preferential tax treatment accorded to publicly owned electric enterprises is, in the aggregate, more than one-third of the total value of the investment in the private, tax-paying electric utility industry."

In addition to the higher costs incurred by federal tax payments, the presentation asserted, private electric systems also face a second tax-born cost disparity over public power operation—the increased cost of capital when invested in taxable securities over the cost of capital invested in tax-exempt securities, such as publicly owned systems may issue.

Asserting that the power industry's socialization is "gradual," Dorau and Foster added that:

"In effect, the people are being bribed to substitute public ownership for private enterprise."

Costs avoided by public systems through application of federal tax exemptions alone, their presentation declared, amount to at least 14 percent of operating revenues. It added that:

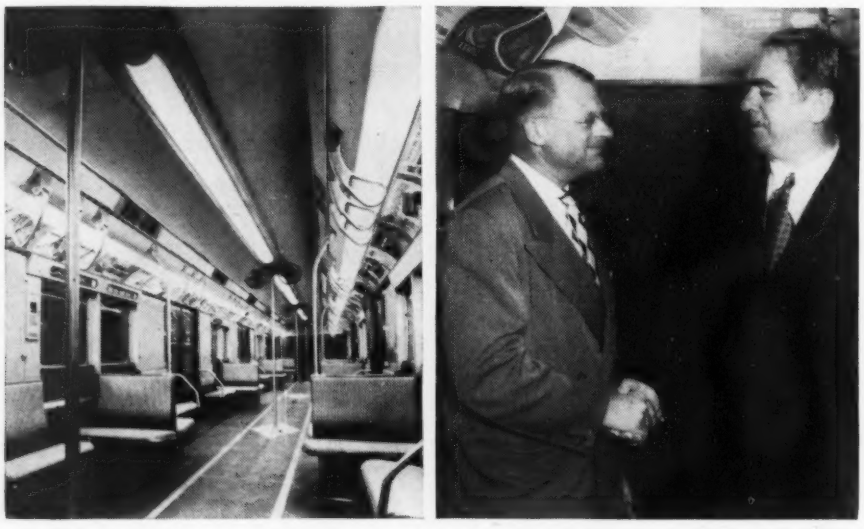
"Taxes have become such a large part of the cost of providing service by private enterprise that investors hesitate to assume the discriminatory tax hazard, particularly when consequences of the unequal tax treatment appear immediate in time or are geographically adjacent."

Heavy taxation of electric power, Dorau and Foster told the committee, has uneconomic consequences. For one thing, it "limits expansion of consumer demand and prevents reduction of cost per unit. . ." In addition, their report asserted:

"Taxes on private electric enterprise are heavier in relation to output than are the taxes levied on non-utility business and industrial enterprises, because of the relatively larger amounts of capital required by the electrical utility for a given volume of business.

"Taxes are operating costs. They tend to raise the price of the service and to curtail demand and output. Therefore, they destroy the substantial economies which would be available from more complete utilization and large-scale operation."

Federal tax avoidance by publicly owned utilities would, if rescinded, produce another $50,000,000 in yearly revenues, based on conditions during the twelve months ended last March 31, the committee was told. The estimate does not include taxes on personal income from tax-exempt securities.



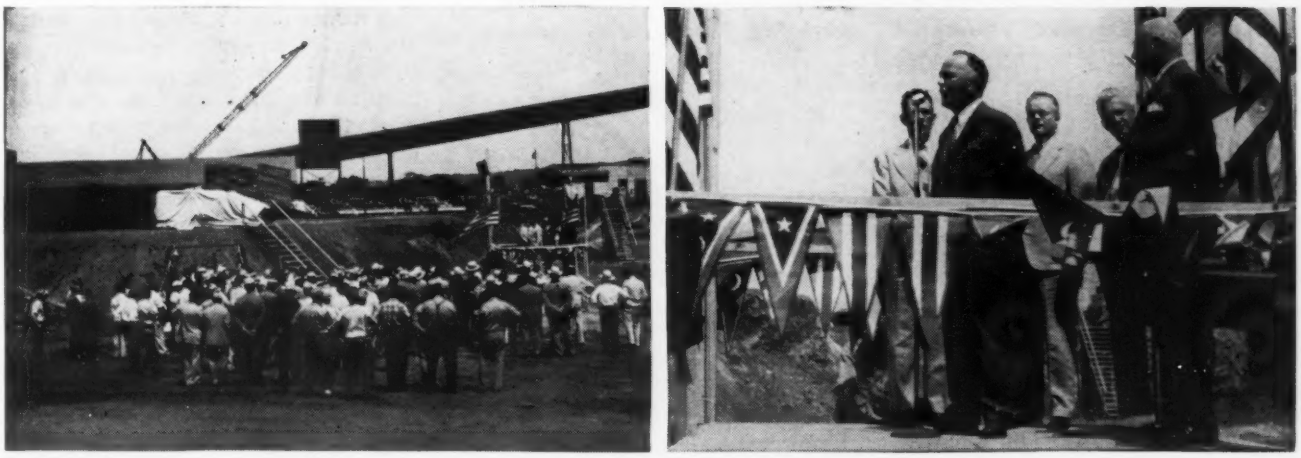
FIRST FLUORESCENT SUBWAY CAR—The first of approximately 650 new metropolitan subway cars to be illuminated entirely by fluorescent type lighting, this train began its run on New York City's IND lines last week. The three continuous rows of instant-starting cold cathode fluorescent lamps especially developed for this use by Sylvania Electric will furnish twice as much light as in present redecorated cars. At the official inspection, Mayor O'Dwyer (right) congratulates Robert H. Bishop, Sylvania vice-president

•

Plant Named Walters

The hydroelectric plant at Waterville, 35 miles northeast of Asheville, N. C., has been named for Charles S. Walters, vice-president and director of Carolina Power & Light Co.

ELECTRICAL WORLD ★ ★



PROJECT DEDICATED—Initial step in the installation of a new 80,000-kw. generator at the Columbia power station of Cincinnati Gas & Electric Co. was taken early this month, with C.G.&E. executives and more than 100 Cincinnati, Hamilton County and northern Kentucky officials participating in a ground breaking ceremony. Walter C. Beckjord, utility president, is shown outlining the company's $12,335,000 electrical expansion program. Others left to right are Cincinnati Councilman Homer Toms, Cincinnati Mayor Carl W. Rich, D. S. Brown, C.G.&E. vice-president in charge of electric production, and Fred Mohr, Hamilton County Commissioner

14-Year Franchise Granted Utility by Spokane Voters

Voters of Spokane, Wash., by a margin of 15,211 to 11,339, approved granting a 14-year non-exclusive city franchise to the Washington Water Power Co. The company had promised to spend about $7,000,000 for improvement of service if the franchise were granted.

Under terms of the franchise, the company will pay to the city 1 percent of its gross revenue from sales of electric power and electric service, plus a 3 percent occupational tax, or a total of approximately $160,000 per year. Additional concessions given the city by the company will add approximately $1,000,000 for the 15-year period, according to Kinsey M. Robinson, president of the company. These concessions include a reduction in the overhead street lighting rate and the cost of traffic signal lights.

In the meantime, WWP announced the purchase of the municipal electrical distribution system and all related facilities from the town of Harrison, Idaho.

A 25-year franchise covering operation of the system was granted by the town at the same time it voted to sell the property to the company.

The Harrison utility had been built by the community in 1921, with electric power purchased on a wholesale basis from the WWP. The company plans to lower rates, install new equipment to increase capacity of the distribution lines, and extend rural service.

"About $25,000" was quoted as the purchase price.

At a hearing on the case before the Idaho Public Utilities Commission, no one appeared to oppose the transaction.

•

2 Dams and Power Plant Planned in New York State

Central New York Power Corp. has filed with the Federal Power Commission a declaration of intention to construct a dam and hydroelectric plant on the West Canada Creek about 14 miles north of Utica. The concrete dam of gravity type is to be 50 ft. high and 300 ft. long. Two 9,600-hp. turbines are to be installed in the power house.

For the purpose of storing flood water for use in existing hydro stations of the utility and of its affiliate, Northern Development Corp., the latter has filed with FPC a declaration of intention to build a dam and storage reservoir on the Raquette River about 65 miles upstream from its confluence with the St. Lawrence River, at Carry Falls.

Hanford Atom Expansion Emphasizes Chemicals

Construction of new chemical process plants, research facilities, improvements to production units and community facilities are included in a big expansion program announced for the Hanford atomic plant at Richland, Wash.

"No details of design, construction or operation will be made public," said the official announcement.

The General Electric Co., which took over the Hanford project from the du Pont Co. after the war, has the prime contract for "process development, design and construction."

"A major part of the program," the announcement said, "will consist of the installation of chemical processing plants, for which considerable development work remains to be done on the processes stemming from research work performed at the Argonne National Laboratories, Chicago, subsequent to the construction of the Hanford works."

Other work in the manufacturing areas will be based on studies of operations begun by the du Pont company.

Competent observers of the Richland scene expressed the belief that another town equal in population to Richland's 15,000 would be built as part of the present expansion.

Southeastern Systems Plan Huge Capacity Expansion

Private Systems in Nine-State Area Study Integration and Installation of 1,836,500 Kw. of Capacity to Insure Region Against Power Shortages Stunting Industrialization

PRIVATE electric utilities in the Southeast have made plans to insure an adequate supply of electricity in the area through a system of network interconnection and installation of 1,836,500 kw. of new capacity through 1950, at an expenditure in excess of $600,000,000. This expenditure and additional generating capacity is in anticipation of an accelerated rate of load growth due to the rapid industrialization of the Southeast.

The Coordination Committee of the Southeastern Electric Exchange, appointed shortly after the annual meeting last April in St. Petersburg, recently began an exhaustive study of power requirements and a system of new interconnections to distribute electric energy to any point within the nine-state area east of the Mississippi from Virginia to Florida.

This gigantic Southeastern power pool will bring into force the coordinated and cooperative efforts of the private utilities to insure against any possible shortages which might develop due to delay in delivery of equipment now on order. Plans now being formulated call for feeding into the network all surplus peak or off-peak power to meet load requirements at any point within the network.

Plans now under way call for the installation of eight new units of 197,500-kw. capacity in 1947; twelve steam units of 472,500-kw. capacity and one 1,500-kva. hydro unit in 1948; 15 steam units of 522,500-kw. capacity and one 20,000-kw. hydro unit in 1949, and 16 steam units of 592,500-kw. capacity and one 30,000-kw. hydro unit during 1950. The utility engineers estimate that this nameplate rating will give net continuous capability of 1,942,500 kw., and net peak hour capability of 2,035,500 kw.

Of the 51 steam units to be installed, 28 are 40,000 kw. or over, including one 80,000-kw. unit, three 100,000-kw. units and five 135,000-kw. units. The trend toward larger units has become more pronounced in the South during recent years and is likely to become standard practice as more manufacturers in the industrial East decentralize and move south.

The program of the Southeastern utilities is the most far-reaching ever undertaken and conforms to estimated increase in power demands ranging from about 20 percent over 1946 for the next three years, and from 30 to 35 percent over 1946 five years hence. Based on present construction and equipment costs, it is estimated that approximately $240,000,000 will be spent for plant and equipment, and approximately $360,000,000 for transmission and distribution facilities. A great portion of this expenditure will necessitate the raising of new capital, a task in itself of great importance.

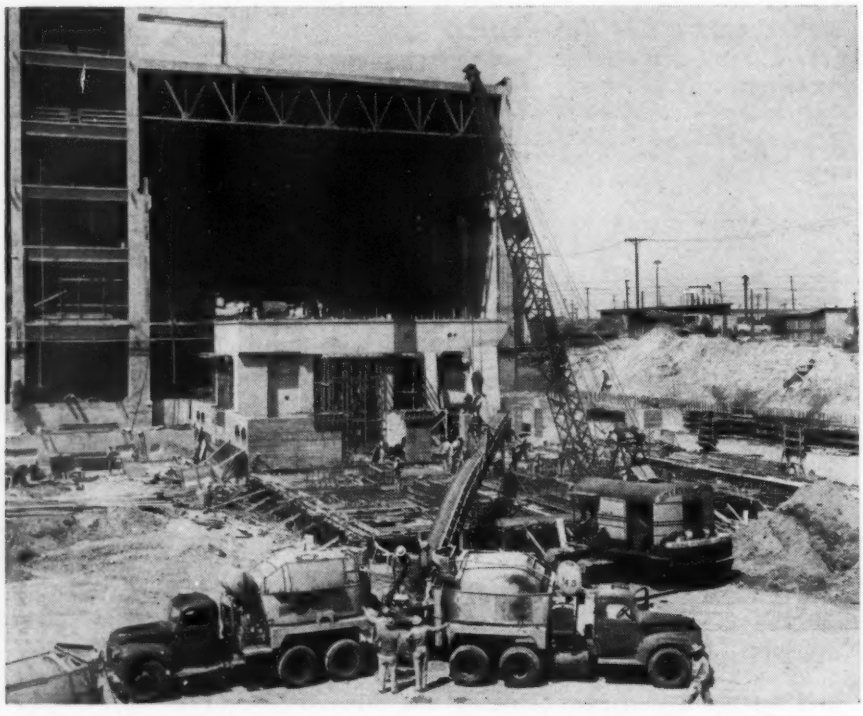
The Exchange Committee has approached the problem of power supply in the area from the broadest viewpoint. All estimates on future power requirements have been based on the assumption that there will be no serious and prolonged slump in general industrial activity.

The possibilities of a power shortage in the Southeast were first emphasized by W. E. Wood, executive vice-president of Virginia Electric & Power Co., at the annual meeting of the Southeastern Electric Exchange in his presidential address. At that time he pointed out that a real shortage in generating capacity was possible for the next three or four years.

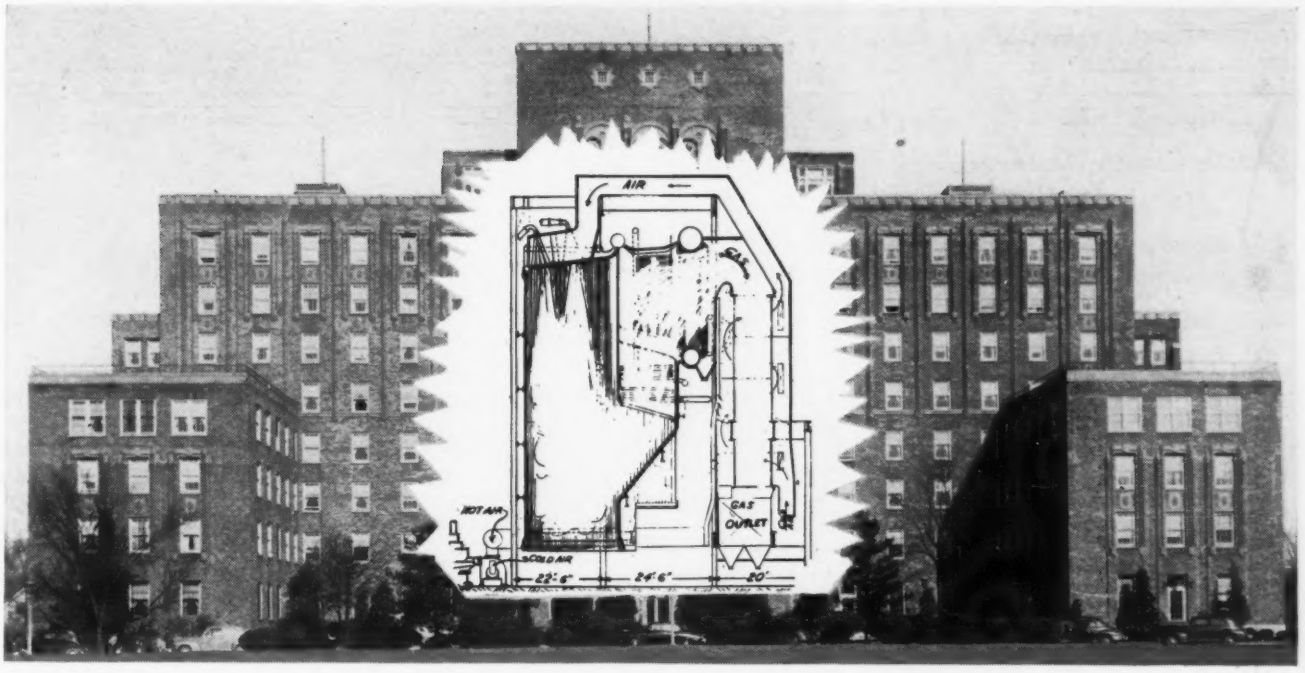
"Few of our companies have sufficient reserve capacity to handle comfortably the continuous and unpredictable load growth with which we seem to be faced," Mr. Wood said. "We are in no way responsible for this shortage of capacity. On the contrary, most of us are endeavoring frantically, and regardless of staggering construction costs, to install additional capacity with all possible speed." Mr. Wood declared that at best, the delivery of certain essential material and equipment must be long delayed.

Although the entire program has not been completed, work is progressing to secure for the Southeastern area the maximum usefulness from the existing capacity and transmission systems, and at the same time insure for the area the greatest reliability and adequacy of service possible under existing conditions.

It is expected that the committee will meet again in the near future at which time operating programs of the individual companies will be coordinated on an area-wide basis.



RUSHING THE JOB—Contractor uses 100-ft. belt conveyor unit to speed the pouring of concrete for the Harbor steam plant of the Los Angeles Department of Water & Power at Wilmington, Calif. A 65,000-kw. unit will be installed



THE BOILERS WILL BE THIS BIG—To convey to the public the size of the two high-pressure boilers which will be installed in its Acme station, Toledo Edison Co. distributed to papers in its service area this picture of the Toledo Hospital on which was superimposed this engineering drawing of one of the boilers. Each will be 90-ft. high and 62-ft. deep

Electrical Workers Name Pair to Top Positions

New men stepped into two top positions in the International Brotherhood of Electrical Workers, A. F. L., this week.

The veteran G. M. Bugnaziet, international secretary for 23 years, resigned to turn his tasks over to a younger man, J. Scott Milne, I.B.E.W. vice-president for the West Coast.

Louis Sherman, special assistant to Secretary of Labor Schwellenbach, was appointed I.B.E.W. general counsel by International president Dan W. Tracy, with whom Sherman was associated while Tracy was Assistant Secretary of Labor. Sherman, who resigned from the Labor Department after eight years on the staff, will fill a post that has been vacant for several years.

Tracy accepted Bugnaziet's resignation "with regrets," but persuaded him to continue to serve the union as executive director of the National Electrical Benefit Fund, recently established by the National Electrical Contractors Association and I.B.E.W.

Bugnaziet, who is also fourth vice-president of the A. F. L., is 69 and has been a member of the I.B.E.W. for 47 years. Before becoming secretary, he was vice-president for 13 years and, for five years, business agent of Local 419, in New York.

Tracy appointed Milne to succeed Bugnaziet as I.B.E.W. secretary and also as secretary of the Electrical Workers Benefit Association, which administers the union's insurance funds, another job Bugnaziet relinquished.

Oscar Harbak, of Seattle, an international representative, will fill Milne's post on the West Coast.

•

Senate Economizers Cut TVA Construction Funds

Abruptly ending its record of generosity toward federal power development projects, the Senate Appropriations committee wielded a new-found economy axe this week on the budget of the Tennessee Valley Authority for fiscal 1948.

Acting on the Government Corporations Appropriations bill, the committee sliced the new appropriations for TVA to $13,117,521—$9,025,979 below the $22,143,500 approved for the Authority by the House last month. None of the other 26 federal corporations provided for in the bill received less from the committee than it had been allowed by the House.

The bulk of the decrease in TVA's budget was sliced from funds the Authority planned to employ on its various construction programs. Completely eliminated was House-approved item of $3,253,000 in new appropriations for work on South Holston and Watauga dams. The committee directed TVA to carry on construction of these projects from the unobligated balance carried over from previous appropriations. This unobligated balance was estimated at $12,000,000.

The committee also jettisoned a House-adopted plan for amortization of the federal investment in TVA's power plant—but apparently not because it lacked sympathy for the objectives of this plan. The House approved a provision drafted by its Appropriations committee calling for repayment within 40 years to the Treasury of all federal expenditures for TVA power facilities.

The Senate group reported that the Comptroller General has made "an exhaustive study of TVA and will shortly submit to the Congress his report, which will include recommendations for repayment (of power investment). The committee believes legislation should await the consideration of this report."

This was the first indication that the General Accounting Office was preparing a new report on TVA. GAO's first report on the Authority, prepared last spring, covered TVA's power operations at some length and recommended a "definite repayment plan for power investment and interest." But it contained no specific recommendations as to the legislative form of such a repayment plan.

The Senate committee retained a House provision calling for repayment by TVA to the Treasury of a total of $10,500,000 during fiscal 1948. It also kept a restriction against the addition

of new generating plants, excluding replacement units, without prior authorization by Congress.

•

Senate Group Restores Atomic Budget Request

An open-handed Senate Appropriations Committee approved an $8,294,000,000 Independent Offices bill last week, adding $126,137,000 more than the House allowed for expenditures by nearly a score of federal agencies during fiscal 1948. Largest increase in the Committee's bill was a $75,000,000 boost in funds for the Atomic Energy Commission.

The committee split sharply over the increase for AEC, which restored the full budgetary request of $250,000,000. The committee also accepted $250,000,000 in AEC contract authorizations, as approved by the House.

The Appropriations subcommittee handling the bill refused to grant an increase for AEC, going along with the House proposal that the Commission return to Congress for a deficiency appropriation when it could justify in more detail its need for more funds. This decision was overruled by the full committee. Committee spokesmen asserted that they were reluctant to take any action which might delay AEC's development program.

Other highlights of the committee's bill included: (1) allowance of $900,000 for the return of several war-dispersed agencies to Washington, with priority for removal of the Securities and Exchange Commission from Philadelphia; (2) increases of $300,000 for salaries and expenses of SEC and $200,000 for the Federal Power Commission. The House appropriations committee previously had refused the request of the Public Buildings Administration for funds to bring SEC and other federal offices back to Washington, recommending that the move be deferred for "at least a year."

In recommending the removal of SEC and offices of five other federal agencies, the committee urged that these offices "be returned to Washington as rapidly as possible, and that first priority should be given to the return of the Securities and Exchange Commission." If this proposal is accepted by the Senate, the House is expected to contest it in conference on the bill.

The increase of total funds for SEC from the $5,738,700 approved by the House to $6,038,700, the committee reported, will allow funds for the compiling of corporation statistics and financial data . . . "such statistics are important to the proper analysis of economic trends of the nation," the report added.

FPC received a total of $3,918,000 under the increase provided by the Senate committee. The Commission's staff testified that it required additional funds for its work in licensing hydroelectric projects, its regulatory activities, and the issuance of certificates for natural gas projects.

VISUAL EDUCATION—The British Columbia Electric Railway Co. uses this table on which fire extinguishers are mounted to teach employees proper use of each

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Alabama Power Co. Settles Gasification Claims Suit

An out-of-court settlement has been announced to a $5,000,000 damage suit alleging "breach of faith" by the Alabama Power Co. and Milton H. Fies, a mining engineer. R. B. Kennedy, a retired miner, had charged that the company and Fies used methods he developed in the gasification experiment conducted recently at the utility company's Gorgas mine in Walker County (ELECTRICAL WORLD, June 28, page 19).

Circuit Judge Leigh M. Clark entered an order to the effect that the suit had been settled in favor of the defendants, with court costs to be paid by them.

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C.I.O. Union Gets Increase

Consumers Power Co. has granted a wage increase of 10 cents an hour or 10 percent, whichever is higher, to about 3,000 employees represented by the Utility Workers Union of America, C.I.O. The union also secured increased vacation and sick benefits.

I.B.E.W. Reorganization Adds Manufacturers' Unit

The International Brotherhood of Electrical Workers is reorganizing its four branches of jurisdiction in the electrical industry into five branches.

This action, recommended by a committee authorized at the San Francisco convention last September and approved by the I.B.E.W. International Executive Council, is being voted on by the 350,000 members in a referendum to be completed July 31. (The convention also created a new classification of "B-A" locals whose members have equal voting rights with "A" locals but do not participate in pension and death benefits.)

The jurisdiction committee was appointed to iron out jurisdictional differences which have arisen between inside electrical workers, outside electrical workers and those employed by utilities. Representatives from the three groups comprised the committee.

The proposed constitutional amendments would organize I.B.E.W. members under five branches:

1. Outside and utility workers.
2. Inside electrical workers.
3. Communications, voice, sound and vision transmission and transference employees.
4. Railroad electrical workers.
5. Electrical manufacturing employees.

The electrical manufacturing branch is a new one. Outside workers' branch was enlarged to include utility workers. Communications was added to the No. 3 branch.

Besides "outside" workers previously covered, the "outside and utility work-

ers" branch will include all employees of electric generating or distributing companies and have jurisdiction over the operation, repair and maintenance of their equipment and most electrical construction work outside of isolated plants.

The new jurisdictional boundaries will apply to the future, the committee stating it had no intention of upsetting existing arrangements.

The committee admitted that its recommendations would not end all jurisdictional differences, but believes that "its efforts to simplify and clarify will materially reduce misunderstandings and differences."

Daniel W. Tracy, international president, will continue to decide appeal on jurisdictional questions under a section of the constitution which states that, when disputes arise, he should determine what local union will do the work "consistent with the progress and best interests of the I.B.E.W. in obtaining and controlling the work in question."

•

Contracts for 2 Federal Hydroelectric Plants Let

Construction of two federal hydroelectric generating plants and equipment for another are provided in contracts recently awarded by the Bureau of Reclamation.

The Estes and Marys Lake plants on Colorado's Big Thompson River will be built by Morrison-Knudsen, Inc., and Peter Kiewit Sons Co. of Denver at a cost of $2,176,708. Terms of the contract call for completion of the plants, including switchyards, penstock gate structures and penstocks, within 30 months after work starts. The Estes plant will have an installed capacity of 45,000 kw., and a single generator of 8,100-kw. capacity will be erected at Marys Lake.

Electrical control equipment and a power switchboard for the Heart Mountain plant in Northwestern Wyoming will be supplied by Control Corp. of Minneapolis, under a $51,723 contract. Construction of the plant, which will have an installed capacity of 5,000 kw., already is under way.

Index To Be Available

Copies of *Electrical World's* semi-annual index are being printed and will be available shortly. Subscribers may obtain copies without cost by addressing a request to: The Editor, *Electrical World*, 330 West 42nd St., New York 18, N. Y.

Senate Group Urges Advance Study of Generating Loans

Appropriations Group Reinstates $25,000,000 Cut in Loan Fund Authorizations but Directs Rural Electrification Administration to Submit Generating Loans to Congress

FUTURE LOANS by the Rural Electrification Administration for the construction or acquisition of generating plants will get advance screening by Congress, if the House accepts the Senate version of the Agriculture Approprations bill.

Approving fiscal 1948 appropriations totaling $664,836,000 for the Department of Agriculture—$92,664,000 more than the House allowed the Department—the Senate admonished REA to stick to giving electric service to farmers. As expected, however, the Senate proved more generous than the House in providing funds for the lending agency, upping REA's loan funds by $25,000,000, to a total of $250,000,000, and its administrative budget from $4,000,000 to $5,000,000.

Approves Accounts Transfer

The Senate agreed with the recommendations of the House and its Appropriations committee that REA should borrow all of its loan funds directly from the Treasury, rather than obtaining the bulk of such loans from the Reconstruction Finance Corporation. The House amendments of the Rural Electrification Act, transferring the agency's accounts with RFC to the Treasury as of June 30, 1947, were accepted by the Senate without change.

Echoing the concern of the House Appropriations committee over federal financing of electric generating facilities, the Senate went a step farther, writing into its report an order directing REA to notify Congressional appropriations committees in advance of making any loans for such plants.

"The committee instructs the administrator of REA to report to both the Senate and House Appropriations committees in writing 30 days in advance of approving allocations of funds for acquiring or building generating plants," the report directed.

Sources close to the Senate Appropriations committee revealed that a number of Senators demanded an even more stringent check on REA loans for either generating or transmission facilities and that the final language of the report represented a last-minute compromise. Proponents of the order to REA urged its incorporation in the committee's report, rather than in the bill itself, since the Senate would be extremely unlikely to order a change in the report, it is claimed.

The committee's order, on the other hand, is likely to be as effective as law. REA officials told an ELECTRICAL WORLD representative that they were not considering any alternative to compliance with the committee's instructions. The form of such compliance, they added, posed a problem, however. Among the solutions considered was the submission of all applications for generating loans to the committees immediately following their receipt by REA.

The Senate committee made it clear that it was opposed to unlimited loans by REA for either transmission or generating facilities. "The committee emphasizes," the report said, "the importance of giving electric service to groups of farmers in greatest need and admonishes the Administration not to engage in power line or generator construction where such service can be obtained at reasonable cost of power."

In adding $1,000,000 to the agency's administrative funds, the Senate returned all except $600,000 of the funds requested for this purpose.

The $250,000,000 loan allocation was the full amount requested in REA's budget.

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National Farm Group Names Operating Committee

An operating committee to serve in connection with the development of the 1947 program of the National Farm Electrification Conference has been appointed by Chairman Hansel Schenck.

Members include: George Rietz, General Electric Co.; Frank Watts, *Farm Journal;* Roy Godley, Edison Electric Institute; Truman E. Hienton, U. S. Department of Agriculture, and George W. Kable, *Electricity on the Farm.*

At a meeting held by this group at National Electrical Manufacturers Association in New York, announcement was made that the following four men will serve as chairmen of panel discussions to be conducted at the conference: Prof. J. H. McLeod, University of

Tennessee, Knoxville; J. R. Waters, Monongahela Power Co., Fairmont, W. Va.; Hugh Curtis, *Successful Farming*, Des Moines, Iowa; and Mr. Rietz.

They have been assigned to handle the following topics: Prof. McLeod, Education and In-Service Training; Mr. Waters, Farm Wiring and Re-Wiring; Mr. Curtis, Problems of Distribution and Servicing of Equipment; Mr. Rietz, Farm and Home Uses, Market and Research Work, Unfilled Farm Electric Needs, etc.

•

Franchise Not Binding After Town Incorporates

The Texas Supreme Court has ruled that a utility franchise granted before the incorporation date of a town does not bind the town after incorporation. As a result of its ruling, Gulf States Utilities Co., of Beaumont, will have to remove its poles and lines from Hempstead, Tex., unless the high court reverses itself upon rehearing, which has been asked by the company.

The Supreme Court did overrule Hempstead's objections to the 90-day period for removal of facilities which had been granted Gulf States by a lower court.

Hempstead's mayor told ELECTRICAL WORLD that the city has its own distribution system and power plant ready to operate. A Gulf States spokesman says the situation will remain unchanged, despite the high court's decision, pending the resumption of business at next fall's court term. The plea for rehearing by the company had not been acted upon when the court recessed July 9.

Gulf States lost its original fight against the Hempstead removal order when the trial judge held for the town. On appeal, the Civic Appeals Court granted the company a permanent injunction against the Hempstead order. It was this injunction which was overruled by the Supreme Court, which said in part:

"After Hempstead was incorporated, the company's use of the public ways of the town was at the town's sufferance, and its acquiescence in that use might be terminated upon reasonable notice."

•

Co-Op Gives Up Charter

The Nyco Electric Cooperative has reached the end of its corporate existence, with dissolution ordered by Superior Court Judge Henry C. Kelly. The co-op requested such action after failing to obtain a franchise to serve northern Yuma County, Arizona.

Skagit County P.U.D. Asks Rehearing on Puget Power

The Washington State Supreme Court has been petitioned by the Skagit County P.U.D. to reconsider its ruling invalidating the P.U.D.'s proposed $135,000,000 purchase of the Puget Sound Power & Light Co., as illegal.

Principal point in the petition is the contention that an act of the 1947 state legislature, passed since the re-argument of the P.U.D. case on January 30, validates the bond issue necessary in the purchase "and all proceedings relating thereto."

The act in question was designed to correct irregularities in a school election in eastern Washington, but is described in P.U.D. petition as "a curative or validating statute, the effect of which is clearly to validate the entire transaction and all proceedings before the court" in the P.U.D. case. It states, in part, that "all bonds heretofore issued for the purpose of financing . . . any work, undertaking or project by any public body, including all proceedings for the issuance of such bonds . . . is hereby validated, ratified and approved, notwithstanding any lack of power (other than constitutional) of such public body."

The petition for rehearing also declares that the majority opinion in the P.U.D. case "completely fails to take cognizance of the extensive, undisputed evidence in the record which discloses that the transaction before it is the proposed acquisition of electric utility systems by the 15 P.U.D.'s served by the Puget system, through the cooperative purchase of the Puget system, the 15 districts acting jointly, by contract, through the agency" of the Skagit P.U.D.. "all pursuant to the express authority granted the districts by statute to contract with each other 'for carrying out any of the powers authorized' by the act."

Another point in the petition contends the majority opinion "does violence to the plain meaning of the unambiguous language of a legislative act, by applying rules of statutory construction which have no place in this case, and the use of which is not supported by the authorities cited by the majority opinion as the basis for the application of those rules to this case."

The majority opinion so narrowly construes the powers of P.U.D.'s as to make impossible even a piecemeal acquisition by each district of the portion of the Puget system which serves the district, the P.U.D. petition declares.

The petition claims that the opinion contains "serious misconception of the engineering aspects of power supply" in holding that a district has the right to purchase generating capacity outside its limits only to the extent of peak load requirements without reference to standby power needs. The integrated Puget facilities are the only available means for meeting such standby needs, the petition maintains. It added that it would cost Skagit County P.U.D. alone an estimated $175,000 annually at present power rates, to buy firm standby power even if available, if the decision prevents the P.U.D. from purchasing facilities to include standby capacity.

Puget Sound Public Utilities District Association has also directed its legal counsel and Guy C. Myers, fiscal agent, to petition the state supreme court for a rehearing of the court's ruling.

MEETINGS

Previously Listed

American Institute of Electrical Engineers—Pacific General Meeting, San Diego Hotel, San Diego, Calif., Aug. 26-29.

American Society of Mechanical Engineers—Fall Meeting, Hotel Utah, Salt Lake City, September 1-4.

Illuminating Engineering Society—Technical Conference, Roosevelt Hotel, New Orleans, September 15-19.

Indiana Electric Association—Annual Convention, French Lick Springs Hotel, French Lick, Ind., September 17-19.

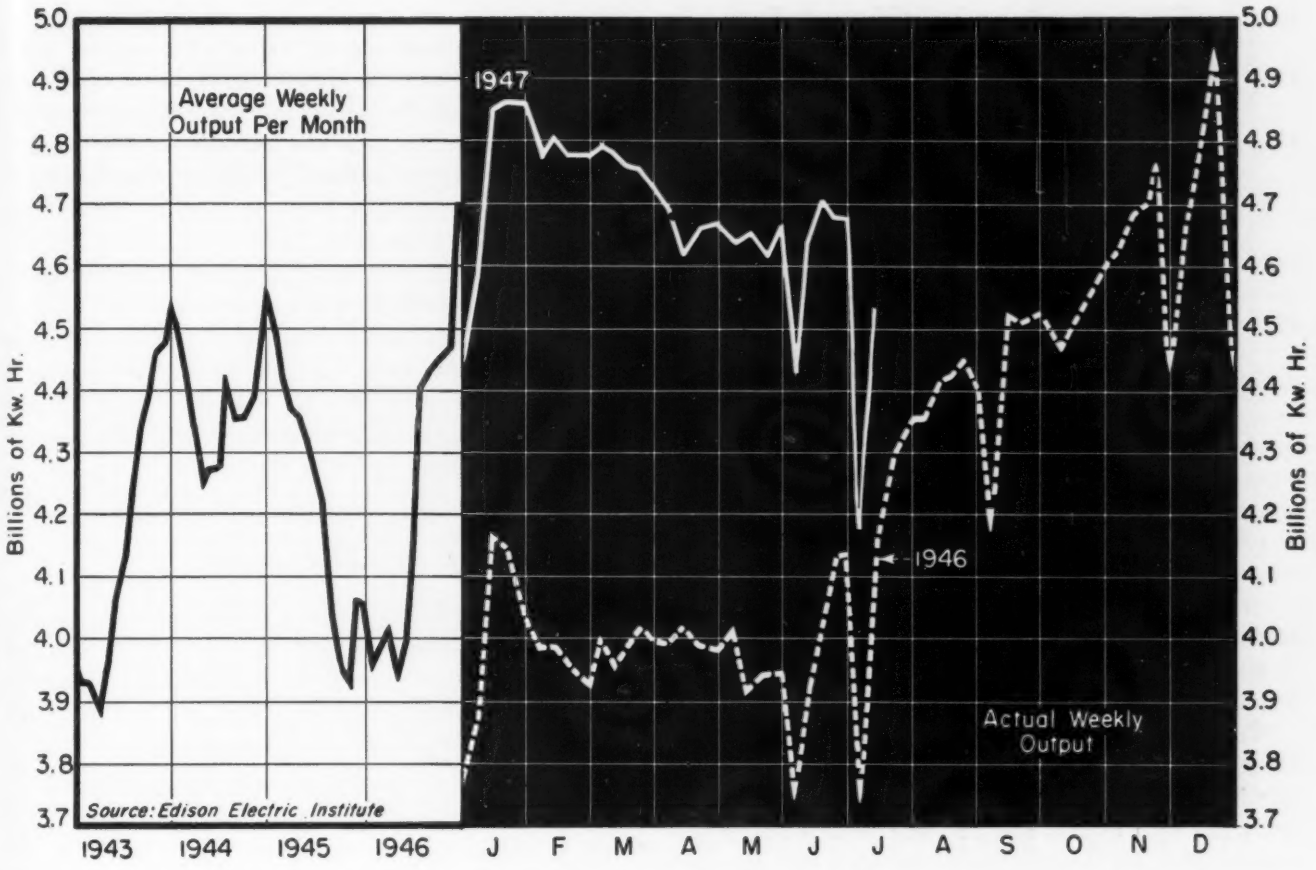
National Farm Electrification Conference—Claypool Hotel, Indianapolis, October 7-8.

SEC RULINGS

CENTRAL VERMONT PUBLIC SERVICE CORP. has been authorized to borrow from one or more banks, during the remainder of 1947, an amount not in excess of $1,600,000 (including $550,000 presently outstanding short-term obligations) and to issue from time to time in evidence thereof its promissory notes with a maturity of not more than nine months from the date of issue thereof. Proceeds of the loans are to be used to finance the company's construction program (including the rebuilding, repairing and replacing of certain of its properties damaged by flood) prior to the time when funds will be available from permanent financing. (Release No. 7510).

EASTERN KANSAS UTILITIES, INC., has been authorized to sell to North Western Mutual Life Insurance Co., Milwaukee, $600,000 of first 2⅞s, series, due 1967, at par plus accrued interest, and to issue and sell to Continental Gas & Electric Corp., parent, 1,500 shares of $100 par common stock for $150,000. (Release No. 7447).

MISSISSIPPI POWER & LIGHT CO. has been authorized to sell under competitive bidding $8,500,000 of first mortgage bonds, series due 1977, and to use proceeds to retire short-term loans and for construction of new facilities. (Release No. 7452).



Northwest Referendum Will Be Held on Dam Licensing

The people of Oregon will get to make an important decision in the Northwest battle of public vs. private power when they vote in November, 1948, at a general election to rule whether private power companies can keep their dams for the period for which they are licensed.

The voting will show whether the people will stand behind the state legislature, which recently passed over Governor Earl Snell's veto a measure which protected owners of dams from condemnation proceedings by amending the 1931 Hydroelectric law which allowed such a take-over, or whether they will back the Governor and the old law.

The referendum was the result of activity on the part of the State Grange, Oregon Farmers Union, and other public power advocates. There were 17,557 signatures.

The bill was introduced into the 1947 legislative session at the request of the Idaho Power Co. which has plans to build a $12,000,000 dam on the Snake River to supply power to eastern Oregon. The project, which would add 60,000 kw. to the company's system, could not be started without the assurance of permanency guaranteed by the new amendment. During the discussions on the floor of the legislature it was pointed out that no private capital had been invested in power projects since the original act was passed in 1931.

Although Idaho Power has applied to the Oregon Utilities Commission and FPC for licenses which would allow start of construction, it was believed that the project would be postponed until the elections.

In the meantime the Army Corps of Engineers held a public hearing in Lewiston, Idaho, on proposed dams on the Upper Snake. One of these, the Hell's Canyon Dam, has a potential power capacity of 1,350,000 kw. and is located nearby the site for Idaho power's project.

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Ebasco to Advertise

Ebasco Services, Inc., will begin national advertising campaign for the first time in its 40-year history in July when various national magazines, trade papers, and business newspapers will be used.

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Now All 60 Cycles

Rochester Gas & Electric Corp. has completed changing its service from 25 to 60 cycles.

Output Swings Upward

Following the usual seasonal trend again, the electric output curve moved sharply upward during the week ended July 12, 1947, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power companies of the country amounted to 4,530,533,000 kw.-hr., comparing with 4,189,824,000 kw.-hr. (revised) during the preceding week, which contained the July 4 week-end holiday. During the week ended July 13, 1946, the amount of electrical energy distributed totaled 4,156,386,000 kw.-hr., this year's figure representing an increase of only 9.0 percent.

Weekly Output, Millions Kw.-Hr.

1947		1946		1945	
July 12	4,531	July 13	4,156	July 14	4,295
July 5	4,190*	July 6	3,741	July 7	3,978
June 28	4,675	June 29	4,133	June 30	4,353
June 21	4,676	June 22	4,129	June 23	4,358
June 14	4,702	June 15	4,030	June 16	4,348
June 7	4,635	June 8	3,920	June 9	4,327
May 31	4,429	June 1	3,741	June 2	4,204
May 24	4,663	May 25	3,942	May 26	4,330
May 17	4,616	May 18	3,939	May 19	4,377
May 10	4,653	May 11	3,911	May 12	4,302
May 3	4,640	May 4	4,012	May 5	4,397
Apr. 26	4,668	Apr. 27	3,977	Apr. 28	4,416

Percent Change from Previous Year

	July 12	July 5	June 28
New England	+ 0.1	+ 9.7	+ 6.6
Mid-Atlantic	+ 4.9	+ 7.8	+ 6.2
Central Industrial	+10.3	+12.4	+12.8
West Central	+ 7.9	+11.3	+11.2
Southern States	+ 7.5	+12.0	+16.1
Rocky Mountain	+19.5	+18.0	+18.5
Pacific Coast	+14.6	+15.3	+19.5
Total United States	+ 9.0	+12.0*	+13.1

* Revised

Electrical World

OPINION

"Electronics" Is Unimpressed

RECENTLY, we viewed with alarm a change in the rate structure of the Norwich, Conn., municipal system which requires owners of television sets to pay what amounts to a demand charge for service to their sets. Herewith, we present the reactions of the McGraw-Hill magazine, *Electronics*, whose readers include television experts of all descriptions. We believe *Electronics*' reactions will be of interest to all utility people who, increasingly, will have the television problem affecting their systems.

"Privilege . . . Since May first last, owners of television sets served by the Norwich, Conn., municipal power plant have been required to pay $1.26 net extra on their electricity bill each month, not for juice (which is charged as usual), but for the privilege of having a set connected to the system. This is, as yet, a minuscule threat to the television industry, but it is a prime example of how misinformation can get worked into the rate schedule of a public utility. The extra charge was worked out by a reputable firm of consulting engineers on the following thesis: A television set requires about five times as much power as the average radio set. It is used primarily at night. When an outstanding program is available, all the video sets are turned on, and the demand on the electric system goes up, at a time when the lighting load is already high. So extra load capacity must be provided to take care of the television sets. This capacity costs money and must be paid for, preferably by the owner. So far, the argument makes some sense, or will when everyone in Norwich has a television receiver and gangs up on the power company all at once, an event several years away by any count. But the large charge of $1.26 gives us cause to wonder how it was figured out. And our wonder is increased when we hear that a large part of the charge is for demand capacity taken by 500 to 1,000 watts of extra lighting which, the consultants claim, will be turned on only when the television set is working. This is certainly a new idea to members of the television audience, most of whom have been busy turning lights off before sitting down for television entertainment. The consulting firm claims that the new television sets will have pictures so bright that the viewer cannot stand to view them without brightening up the room some 500 to 1,000 watts' worth. Whew! The new picture tubes are bright all right, but they are operated at peak brightness only when sunlight streams in the windows and it is inconvenient to draw the shades. At night, the televiewer adjusts the brightness control to suit the normal room illumination. True, he doesn't have to turn off any lights. But, by all that's holy, he doesn't have to turn any on. Viewers in Norwich are advised to look for real estate across the town line. Or better yet, invite the power company manager in to see the ball game (night game, that is)."

Electronics takes issue with the Norwich television rate program on the basis of a disputed set of facts, whether or not extra lights will be required to permit set owners to use their instruments. ELECTRICAL WORLD opposes it for a different reason. We see it as a false obstruction to the sale of kilowatt-hours. We think any such obstructions should be removed, not erected.

Taxation of Federal Power

SOME SURPRISE has been evoked in the utility industry by Southwestern Power Administrator Douglas Wright's recent testimony that Congress might properly explore the possibility of levying taxes, or "in-lieu-of-tax" payments, on federally owned power systems.

This position by a top-ranking member of the Interior Department's power hierarchy is not so new as it might seem. Interior people have discussed it more or less candidly on an "off-the-record" basis for some years. What is really surprising is Wright's answer to a question as to whether it would be proper to assess federal systems with the same amount of taxes that a private utility would pay on a comparable amount of revenue. Wright replied that he thought this would be "one fair measure Congress ought to use in considering it."

If this be Interior thinking, then much change has been accomplished, for this implies payment of or payments equal to federal income tax. Hitherto, Interior thinking has been along lines of recompensing state and local subdivisions for taxes lost through federal acquisition of going systems or undeveloped property. And it has held to the concept that such taxes, or payments in lieu of taxes, should stand at the level in effect when the property passed to federal use. This position has been based on the concept that by its very existence, a federal power system increases the assessable and taxable base of its area, thus creating of itself new tax revenues. This is true of course. It's only fault is that a privately owned utility similarly creates new taxable values—which are taxed.

We hope Congress will pursue its study of the tax differential between classes of ownership and climax it by writing into law one or another forms of adjustment. This will permit a valid comparison of private and publicly owned system financial statements. By doing so, and by adjusting the variables in interest components, Congress will take a tremendous step toward equalizing the competitive situation within the power industry and thus will earn itself considerable surcease from the constant clamor which arises out of the power ownership issue.

Soil Moisture Significant

MOISTURE CONTENT of soil is recognized as a large factor in the resistance value obtainable when a protective conductor is earthed. This is attested by the use of salt for the sake of the hygroscopic properties that hold moisture in its vicinity. It is certainly known that dried-out soil is a poor conductor no matter what its mineral composition. Thus any means to keep the moisture where it is wanted is helpful, even if it be but the slight puddling action resulting at the base of a pole as the pole "works" under variations in stresses on it. The pole butt and the earth around it are usually found moist.

All of this leads to the thought that moisture content could often be taken as the dominant, if not the sole, index of probable earth resistance in advance of placing the grounding devices. Against this suggestion, however, there is the fairly common experience of getting a "poor ground" in soggy soil along a river. That anomaly would have to be resolved.

However, there is one aspect of soil for which its moisture content is being recognized as a ruling index; that is in connection with the holding power it offers to guy anchors. Recent tests, soon to be published, confirm quite well the contention that pull-out values for various forms of anchor are in the order of a half as much in plastically wet soil as in hard, dry hardpan and a third as much in loose wet soil. This information will fill the void left in safety stipulations, which stop at the mere requirement that guying and anchoring be provided without recognizing the variability in the anchoring.

In short, the "feel" of the soil in the hands appears to be a fair index of the holding power of an anchor. The drier the better, generally speaking. Maybe it is true that the converse is as nearly comprehensive for grounding, and that bore sampling would not be a futile preliminary to extensive and important grounding pattern. Subsequent tests would be a concluding check.

Utility Press Relations

ELECTRIC UTILITIES were criticized recently at the Public Utilities Advertising Association meeting for their handling of press relations. The criticism came from professionals—and, in our opinion, often is justified. Unfortunately, the criticism went to the advertising and public relations men, not to the top executives.

Much of the electric utility industry seems never to have realized that its traditional policy of secretiveness in press relations is shortsighted, to say the least. Beyond question, it can prevent newspapermen from obtaining information to which only the top company people have access. It cannot, however, prevent a newspaperman from writing a story. Generally, there are two sides to every story. The utility which prevents a newspaperman from obtaining the company's side cannot prevent him from obtaining—and printing—the other. Only rarely is the result what a utility would call good press relations.

WASHINGTON COMMENT

By R. N. LARKIN

CONNECTICUT'S Rep. William Miller, author of two bills redefining Federal Power Commission jurisdiction, has assailed as "rewrite men for Government propagandists" Tom Stokes, Pulitzer prize winner, national columnist and one of the nation's most competent newsmen; Marquis Childs, another top newsman nationally syndicated; and Lowell Mellett, national columnist and one time Scripps-Howard editor. Miller didn't mention Ruth Finney, Scripps-Howard veteran, who wrote as they did. The seven stories these four published between July 1 and 7 are the basis of the House investigation of alleged FPC propagandizing.

It would have been difficult for Miller to have made a more stinging remark to writers of such standing than his allegation of "rewrite men for government propagandists." But it will be hard for the writers concerned to demonstrate that it isn't merited, so similar are the ideas, citations and even phrases in the seven stories.

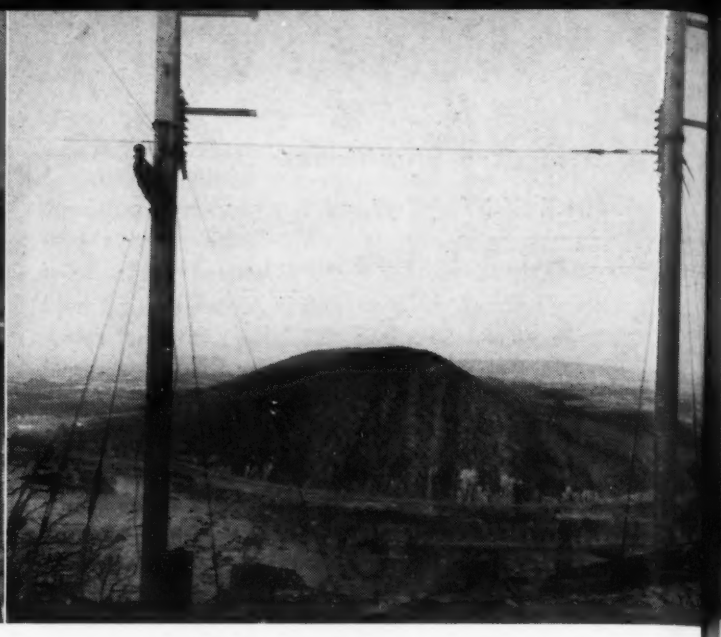
Miller says they took an FPC man's story on his bills without attempting to check it or print both sides. Certainly, each got the story from a pro-FPC source. Certainly, no story attempted to give the whole picture.

Miller says neither Stokes, Mellett, nor Childs attended any of the hearings. Any reporter discussing thus categorically so involved and important an issue might be expected to do so. Miller, a committee member, should know whether they did.

These four described the Miller bills in part as follows: a "sneak offensive," a "hurry-up attempt," "slip through Congress in a hurry," (Stokes); a "move from the rear by stealth," which has "almost escaped attention," and might be "slipped through in a last-minute jam," (Childs); a "quiet drive" to repeal "by indirection," (Finney); and a move "so quietly as to escape public attention," which came to FPC attention "at the eleventh hour," (Mellett). These comments, only one of many such patterns, aren't quite right. The bills were introduced April 7 and went to FPC for comment April 9. One has been introduced in each of the last three Congresses and is intimately known to FPC. ELECTRICAL WORLD has printed six stories on them this year, *Business Week* and *Newsweek* at least one each. Miller arranged a broadcast on them last month.

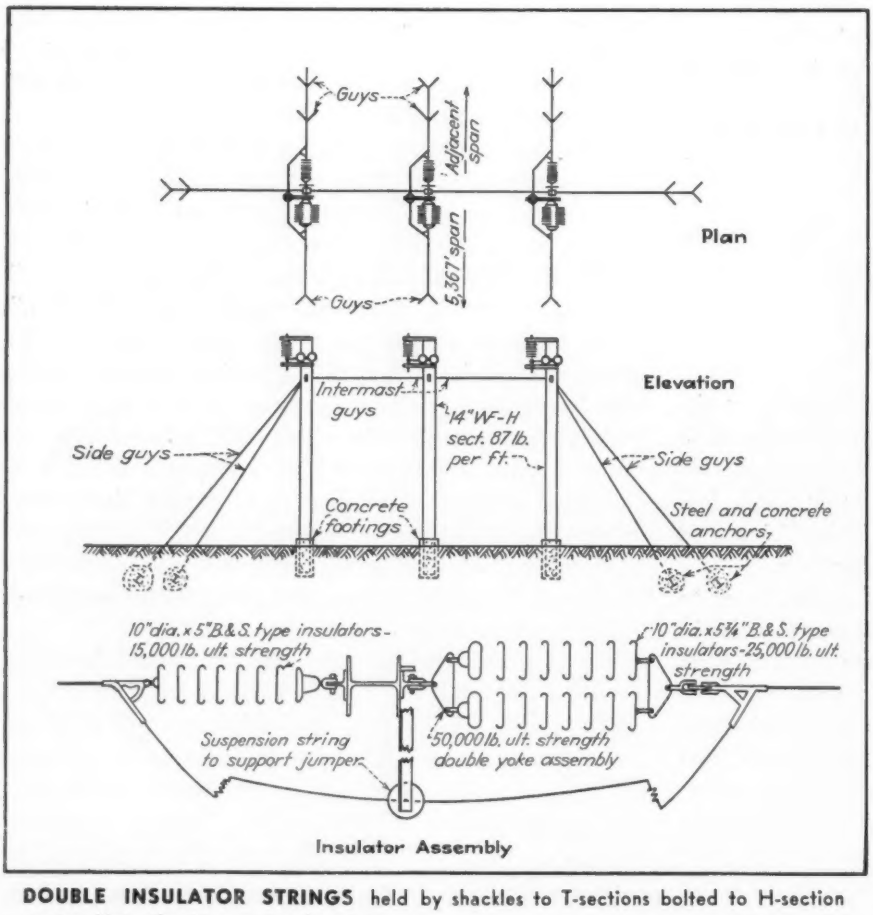
The most unfortunate aspect of all this is not that four good reporters fell for a phoney. It is rather the possibility that the incident may damage the growing reconciliation between FPC and the industry it regulates. Neither the government, the industry or the public has profited from the years of emnity. Without implying that FPC was about to climb into the industry's pocket, the public interest could suffer if the incident prolongs the quarrel.

BERRY MOUNTAIN GORGE on the Susquehanna near Millersburg, one of the longest crossings in the country—5,367 feet



NOVEL SUPPORTING STRUCTURES for the long crossing consist of three guyed H-section masts at each end of span

Mile-Wide Gorge Spanned



DOUBLE INSULATOR STRINGS held by shackles to T-sections bolted to H-section masts. Note the 13 guys in plan view

FRANK W. PACKER
Transmission Engineer
and
CARL H. SCHOFER
Asst. Transmission Engineer
Pennsylvania Power & Light Co.
Allentown

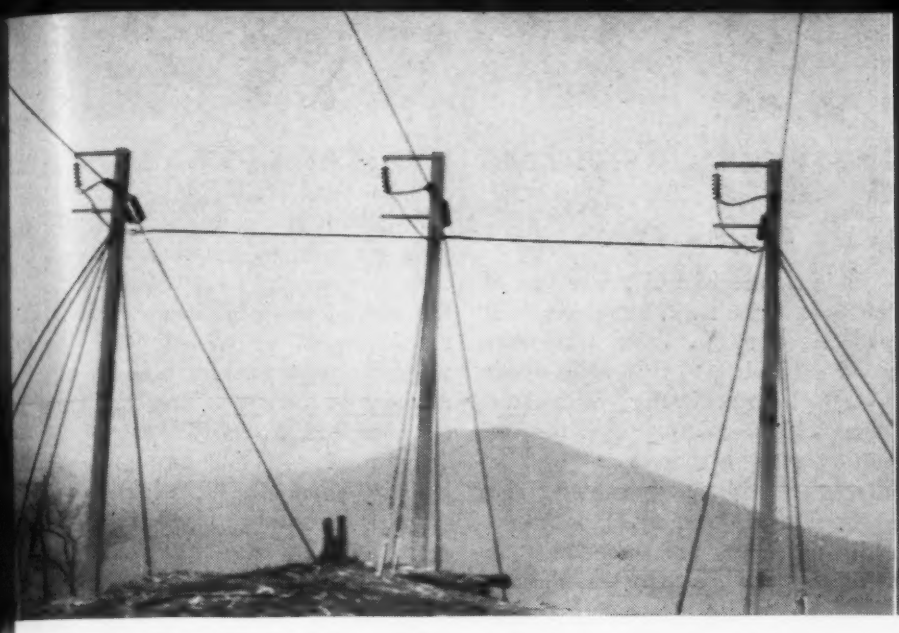
DURING the month of November, 1946, one of the longest river-crossing spans in the United States was completed over the Susquehanna River on the brink of Berry Mountain Gorge, approximately one mile south of the town of Millersburg in Dauphin and Perry Counties, Pa.

This crossing span, 5,367 ft. in length, is part of the Newport-Millersburg Transmission Line built for operation at 66 kv., with initial operation at 23 kv. It crosses the Susquehanna River, two state highways, telegraph and telephone lines and the Pennsylvania Railroad.

Supporting structures on each side of the river are 670 ft. above river level. Conductors sag to within 125 ft. of the river.

This location was selected because:—

1. It is along the most direct and



OUTSIDE MASTS have five guys, middle one has three. Lower arms are for mounting expulsion gaps in lieu of overhead ground wires. Note outrigger jumper supports

TEMPORARY EXTENSION to pole provided railroad clearance during stringing

on Guyed H-Section Masts

Susquehanna crossing of 5,367 ft. from 670-ft. elevations uses three separate, guyed masts of H-Section on each side . . . No ground wires, expulsion tubes instead . . . Radio used in stringing operations

economical route between Newport and Millersburg.

2. The most practical alternate route would have resulted in a line approximately 6 miles longer, using an island which is inaccessible during periods of high water.

3. Preliminary investigation disclosed that the entire river could be spanned and thus eliminate the costly construction and hazardous location of towers on islands.

Design of Crossing Span

Preliminary engineering established the feasibility of crossing the river at this point before right-of-way over this direct route was acquired. This resulted in the selection of a 5,367-ft. crossing span as being most economical.

Engineering problems which entered into the final design were:—

1. Type of supporting structures.
2. Type of conductor.
3. Proper spacing of conductors to afford reasonable assurance of not swinging together during windstorms.
4. Lightning protection.
5. Other details to meet minimum requirements of G.O. No. 13 of the Public Service Commission, of the Commonwealth of Pennsylvania, and also the National Electrical Safety Code.

Supporting Structures

The crossing span is supported by a three-mast steel structure at each end, one conductor being attached to each mast. The masts are 14-in. wide flange H-Section weighing 87 lb. per foot, varying in length from 33 to 45 ft. The masts are spaced on 30-ft. centers and are guyed to provide necessary longitudinal and lateral strength requirements. Each mast is imbedded in a concrete foundation 3 ft. square and $5\frac{1}{2}$ ft. deep to spread the downward thrust over a larger area. Each mast is spliced at approximately half its height so as to facilitate handling, hauling and erection. The masts are designed on the basis of 18,000 psi. — 60 L/R in compression, and 18,000 psi. in tension, maximum L/R ratio being 140 on the longest mast. These stress values are in accordance with the requirements of the Public Utility Commission of the Commonwealth of Pennsylvania where crossings over other foreign utilities are involved.

Each structure is supported by thirteen $\frac{3}{8}\frac{1}{2}$-in., 19-strand extra high strength Copperweld anchor guys and a $\frac{3}{8}\frac{1}{2}$-in., 19-strand, E.H.S., Copperweld inter-mast guy, each having an ultimate strength of 37,690 lb. Two anchor guys on each mast provide the required longitudinal strength for the long span. Two side guys in each direction provide the lateral strength. Three additional guys in the direction of the long span, one on each mast, assisted in erection and support all deadend loads in the adjacent spans.

The guys are attached to steel anchors fabricated from 8-in. channels 8 ft. long held together with tie plates and buried 7 ft.

To prevent creepage, each anchor was imbedded in concrete; this provides even soil pressure against uplift. Guy wire ends are equipped with a compression-type clevis to assure developing the full strength of the wire without slippage. A turnbuckle between the end of each guy and the anchors takes up slack in the guy after installation and provides adjustment for proportionate sharing of the load.

Conductors and Insulator Assemblies

The conventional conductor usually employed in this type of line can not be used on a long river crossing because mechanical limitations require a prohibitive sag. The $\frac{9}{16}$-in., 7-strand, E.H.S., 30-percent Copperweld wire used has an ultimate strength of 24,650 lb. The conductor attachments are double-string tension assemblies using 25,000-lb., ball and socket type, 10-in. disc insulators, eight units in series in each string. The crossing is insulated for future 66-kv. operation.

The two outside conductors were installed to a sag of 540 ft. and the middle conductor 510 ft. at 60 F., with no ice or wind load. Increased conductor separation at the center of the span affords an additional safeguard against conductors swinging together during freak wind storms the gorge might encourage. The center conductor will be stressed to 50 percent of its ultimate strength when loaded with $\frac{1}{2}$-in. radial ice and 8 lb. per square foot wind pressure. The load on the two outside conductors will be 48 percent of the ultimate strength under similar conditions. Minimum clearance over the river for the outside conductors is 125 ft. under normal conditions.

Lightning Protection

High cost of erecting overhead ground wires led to installing expulsion gaps on each of the supporting and adjacent structures to drain off lightning charges intercepted by the span. The remainder of this 12-mile line is of modern long-span woodpole design consisting of 2-pole "H" structures supporting the power conductors. Two overhead ground wires and a buried counterpoise provide lightning protection.

Protection of Traffic

Maintenance of traffic was one of the most difficult of all problems. It was necessary to erect temporary wood poles close to both sides of the river to keep conductors from interfering with heavy traffic over two important state highways, as well as interfering with movement of trains over the Pennsylvania R.R. or the use of its dispatching and communication system. Added to these was the difficulty of getting the cable across a swiftly moving stream without becoming hopelessly ensnarled in the cracks and crevices of a rocky river bottom.

Two portable radio sets were used to safeguard the public as well as provide communication between both sides of the river. They were of material aid in the operation. One set was stationed at each end of the job most of the time, although the set which was originally stationed on the Liverpool side of the river was later moved over to the east side along the Pennsylvania R.R. tracks to be in touch with engineers controlling the final sagging operations.

Wire Stringing Operations

The wire stringing operations were as follows:

1. The three reels of $\frac{9}{16}$-in., 7-strand, E.H.S., 30-percent Copperweld steel were placed in position back of the structure on the Millersburg or east side of the river. Each reel contained 6,000 ft. of cable.

2. The end of each reel of cable was then pulled through separate dolly blocks on each of the three masts and then pulled by hand down the steep mountain-side across the state highway, Pennsylvania R.R. tracks and communication circuits to the east edge of the river. A $\frac{7}{16}$-in. stranded plow-steel cable was likewise brought down the steep mountain-side to the river's edge on the west shore, crossing a state highway, Bell Telephone Co., and a 23-kv. line.

3. Simultaneously, a $\frac{1}{2}$-in. hemp rope was started across the river from the west shore with the aid of men in several small boats and wading in the shallow part of the river channel. There are two small islands at the point of crossing which helped in pulling operations.

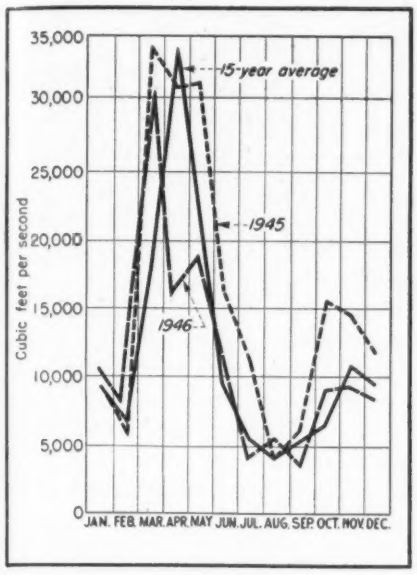
4. The next operation called for pulling a $\frac{7}{16}$-in. plow-steel cable across the river channel by attaching it to the end of the $\frac{1}{2}$-in. hemp rope on the Liverpool or west side of the river, the pulling taking place on the east side of the river along the Pennsylvania R.R. tracks with the aid of a line truck. Aside from temporary snagging among the rocks in the river channel, this operation was completed shortly after noon on the second day. It was necessary to have a steel cable across the river to pull the power conductors across as a hemp rope was not considered strong enough.

5. The final operation, prior to that of sagging, then was started. This called for the fastening of the three Copperweld conductors to the end of the steel cable on the east shore and pulling the steel cable, with the power conductors attached, back across the river to the west shore. This pulling was performed by a winch-equipped truck on top of the mountain on the west shore. Considerable difficulty was experienced as in previous operations, namely, the cables frequently became snagged in the rocky river bottom, requiring constant attention by men in boats to free them without damage to the three conductors.

Concluding Operations

This much of the wire stringing job was completed by the end of the second day of operations. The following day, the conductors were pulled up one at a time from the west shore to the terminal structure on the top of the mountain and attached in the deadend clamps ready for final saggin. At the same time, each of the three conductors was pulled part way up to sag in order to clear the river by approximately 10 ft. and avoid being snagged on rocks.

6. Final sagging was completed on the fourth day without difficulty. Pulling operations on the top of the mountain on the Millersburg side utilized a jeep with a block and tackle. The conductors were sagged one at a time and placed in their respective deadend clamps. The radio relayed sagging instructions from the levelman on the east shore slope to the radio operator on top of the mountain for pulling operations.



CONNECTICUT RIVER FLOW in 1945, 1946 and on basis of 15-year average cfs.

Western Massachusetts Electric Company
Hydro-Equalization Reserve Study

Assumed Year	Mwhr Hydro Generation: Est'd. (a) Generation	14-Year Average Generation	Excess or Deficiency*	Equalization Rate (b)	Equalization Reserve: Additions or Deductions*	Balance
Established Reserve						$400,000
1946	310,524	318,329	−7,805	$.0042	−$32,781	367,219
1947	305,834	318,329	−12,495	.0042	−52,479	314,740
1948	310,330	318,329	−7,999	.0042	−33,596	281,144
1949	332,490	318,329	14,161	.0042	59,476	340,620
1950	279,323	318,329	−39,006	.0032	−124,819	215,801
1951	365,757	318,329	47,428	.0032	151,770	367,571
1952	391,587	318,329	73,258	.0032	234,426	601,997
1953	297,731	318,329	−20,598	.0032	−65,914	536,083
1954	261,928	318,329	−56,401	.0032	−180,483	355,600
1955	241,238	318,329	−77,091	.0032	−246,691	108,909
1956	303,727	318,329	−14,602	.0032	−46,726	62,183
1957	372,717	318,329	54,388	.0032	174,042	236,225
1958	279,453	318,329	−38,876	.0032	−124,403	111,822
1959	403,963	318,329	85,634	.0032	274,029	385,851

(a) These estimated hydro generation figures are identical with those which actually occurred in the period 1932–1945 inclusive.
(b) Estimated on basis of 1945 cost of steam generation and purchased energy, less 40% tax effect and a further 10% deduction. Estimated value is reduced in 1950 and thereafter to reflect anticipated reduction of steam costs when new steam plant comes into operation.
* Light-face figures indicate deficiency or deductions.

Adjust Income to River Flow

Western Massachusetts Electric Co. adopts method to meet fluctuations in river flow and insure more accurate reflection of true earning power—15-year consecutive data used

IN A YEAR of average stream flow, nearly half the output of the Western Massachusetts Electric Co. is generated in hydro plants. The year-to-year variation in plant output is wide because of river flow fluctuations. Any deviation from average hydro generation results in a corresponding but reversed variation in the amount of electrical energy which must be generated by steam, with consequent pronounced effect on earnings. Therefore to the extent that the income statement is affected by the vagaries of rainfall and river flow, true comparative earning power is distorted.

Since these variations in hydro generation are subject to measurement and equalization, the company's management concluded that the basic purposes of accounting would be best served by making suitable equalizing adjustments (ELECTRICAL WORLD, December 28, 1946). President Howard J. Cadwell has authorized publishing further details of this program, which has attracted considerable interest.

From records covering a long period of years averages of hydro output were established and a formula developed for evaluating monthly and annual variations from the long-term averages. After careful study of the data as applied to past performance, $400,000 was appropriated from surplus to establish a "Hydro Equalization Reserve." Application of this formula to the 8.65 percent above-average hydro conditions in 1946 resulted in a $120,826.60 accretion to the new reserve out of current earnings.

In years of below-average hydro generation, and by the use of the same formula, appropriate deductions from the hydro equalization reserve will be added to earnings. It is believed that this practice will result in a clearer presentation of true earning power, and will eliminate a distortion which is especially misleading when comparing the earnings of any two years of sharply contrasting river flow conditions.

The company conferred with the Massachusetts Department of Public Utilities before establishing the reserve plan, and submitted a detailed study for approval. The following presentation is based on this memorandum, which established the program now in effect on the system.

An account under "Other Reserves" (No. 320) was created, bearing the title "Hydro Equalization Reserve," and a starting appropriation of $400,000 from "Surplus" (No. 400) was credited thereto as of December 31, 1946.

Amount and Source

A table of average monthly hydro generation as experienced during the past 14 years was set up. It was proposed that starting January 1, 1947, the variations of monthly generation from the long-term average be determined, and the kilowatt-hour variation from normal be multiplied by a figure representing the estimated value of these kilowatt-hour variations in terms of "steam replacement" or purchased power. That is, the variation from normal hydro generation is evaluated according to its effect on the amount and cost of electricity gen-

erated by steam, or purchased.

One necessary modification of the "multiplier" exists. It is not contemplated that earnings for federal income tax purposes would be adjusted for hydro variations. Therefore the multiplier applied to each kilowatt-hour is reduced by the income tax rate (currently 40 percent with the company's consolidated tax return). Thus, if the value of the hydro variation is 8.4 mills per kw.-hr., the income tax will absorb 40 percent of the variation effect, and the net multiplier becomes about 5 mills. The income tax has the effect of absorbing 40 percent of the costs or savings resulting from hydro fluctuations, and is already acting as a partial "equalizer."

Because the management feels that absolute precision in determining the amount which steam costs would have been increased had hydro not been above normal, or decreased had hydro not been below normal, is very difficult of attainment, the company proposes to reduce further the estimated net multiplier by an arbitrary 10 percent of the gross value. It feels that it is better to fall slightly short of the mark than to over-adjust. This does not mean that substantial accuracy is not possible and this precautionary measure may be abandoned as experience helps in refining the method.

Adjustment Procedure

With the variation from normal and multiplier determined, the adjustment follows: Assume that in 1947 hydro generation works out to be 50,000,000 kw.-hr. above normal and the net multiplier is 4.2 mills. An entry would then be made of Dr. Misc. deductions—$210,000

Cr. Hydro equalization reserve—$210,000

If 1948 river flow results in 20,000,000 kw.-hr. below normal the entry becomes:

Dr. Hydro equalization reserve—$84,000

Cr. Misc. credits—$84,000

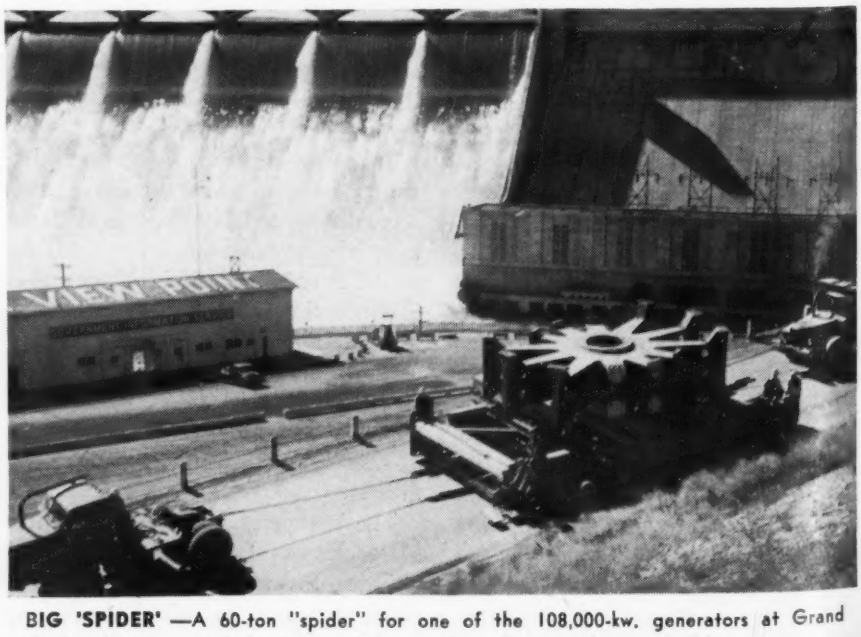
In practice the adjustments are to be made each month, and at the end of the year the net effect of the monthly adjustments equals the proper effect for the year's variation from normal.

In order to illustrate the long-range magnitudes involved and to reach a reasonable "starting appropriation," the company developed a 14-year projection of the plan's operation, as appears in the table. This hypothesis is based on a repetition of the past 14 years' experience as to hydro generation. For this purpose it was assumed that the 1946 hydro output would duplicate that of 1932; that of 1947 would repeat 1933 experience, etc. The net multiplier is estimated on the basis of 1945 average costs for steam generation and purchased energy. This table shows that a reserve starting at $400,000 would, if history repeats itself, reach a high of $601,997 and a low of $62,183. This latter result suggested the $400,000 figure. It is of course not expected that history will exactly repeat itself. The reserve may reach greater heights or exhaust itself entirely. The company believes that exhaustion of the reserve should automatically suspend operation of the plan until above-normal hydro years occur and provide accretions to rebuild the reserve. When the 14-year average became a 15-year average at the end of 1946, and a year is added to the span each ensuing year, any prolonged deviation will change the average.

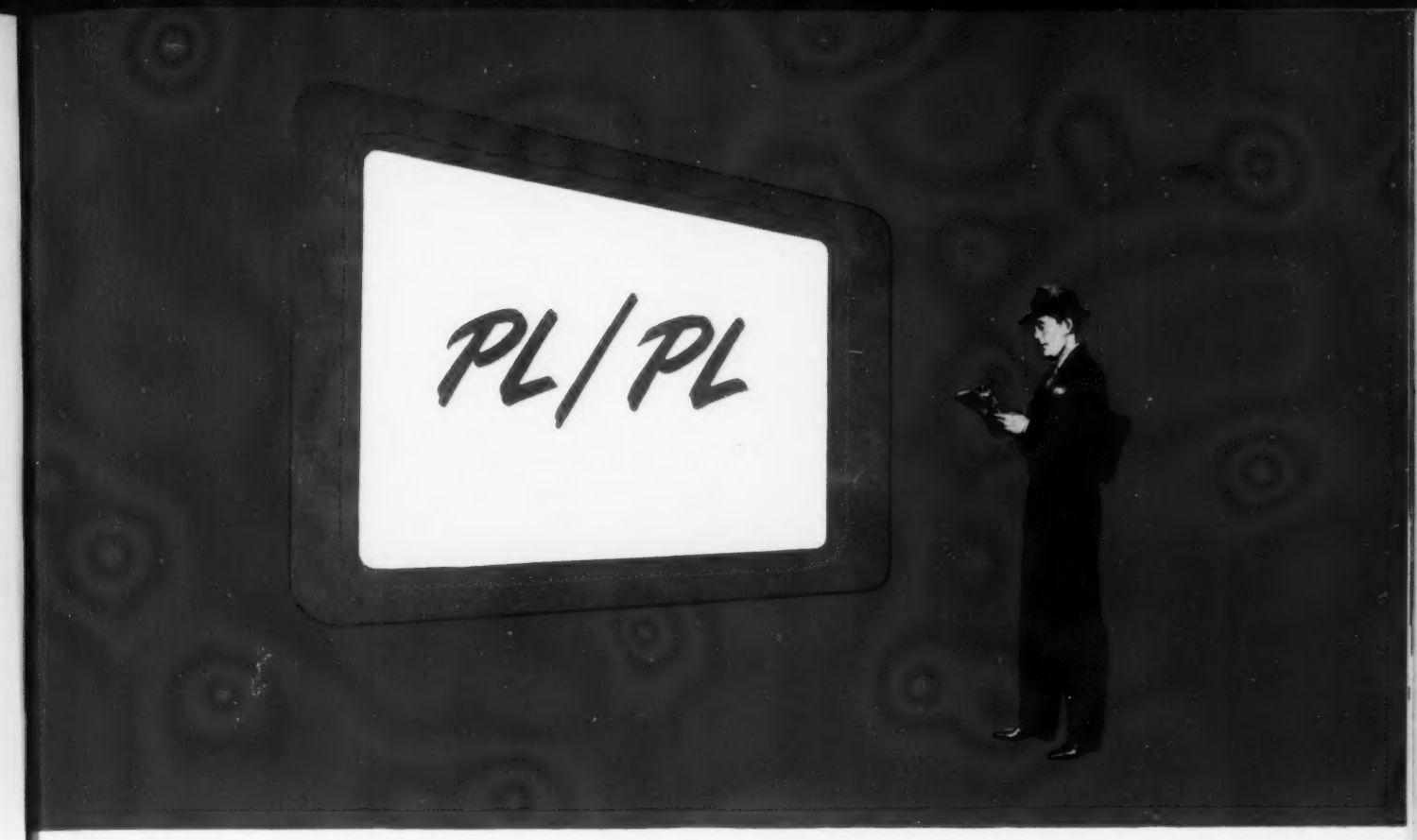
In setting up the original hydro equalization reserve the original $400,000 surplus appropriation was increased by the amount resulting from 1946's hydro excess above normal. With this, operations in 1947 cover a 15-year average including the 1946 experience. The average annual hydro generation for the 15 years was 320,309,000 kw.-hr. That for 1946 was 348,031,906 kw.-hr., giving an excess of 27,722,906 kw.-hr. above the average. This excess multiplied by 4.358367 mills equaled for 1946 a reserve accretion for the year of $120,826.60, and a total debit to surplus of $520,826.60.

The basis upon which the hydro equalization reserve has been set up and placed in operation is designed to achieve a substantial improvement in accounting results. Use of "average kilowatt-hour generation" as a norm provides a solid base from which a start was made. However, it is true that two successive years could have exactly average kilowatt-hour generation and yet one year's generation could have above-normal and the other below-normal value.

This derives from the fact that a given number of hydroelectric kilowatt-hours will differ in value according to the time in which they are generated, on account of the varying efficiencies of the steam plants involved, and which hydro replaces. Again, an above-normal river flow tends to shut down steam units of higher efficiency than units required to be on the bus as a result of subnormal hydro conditions. This would indicate a different multiplier for the two conditions. But any refinement of method involves additional problems and further possibilities of error.



BIG 'SPIDER' —A 60-ton "spider" for one of the 108,000-kw. generators at Grand Coulee dam is moved slowly toward its new home in powerhouse at right



Planned Lighting Program

Opportunity Beckons

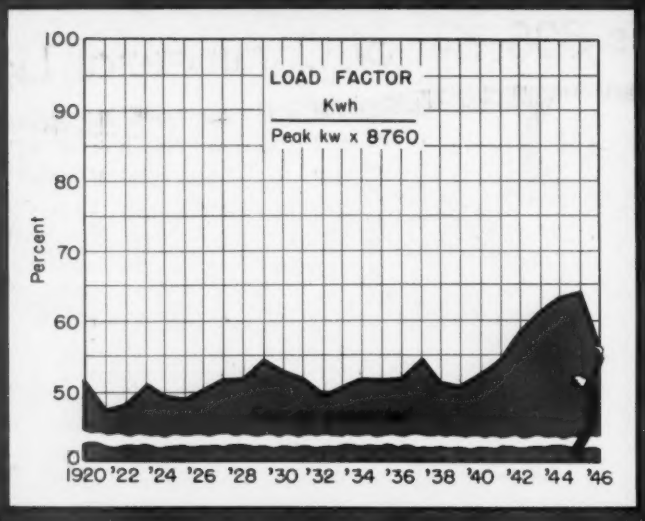
SALES and promotional skill, knowledge and experience, not of one man, nor of two or three, but of 50 or more, are brought to sharp focus in the Planned Lighting Program previewed in the following pages. No one utility, no one maker of lamps or lighting equipment, could possibily command the talent and ability whose work is represented in the program. In it are distilled the know-how of selling of the whole lighting industry.

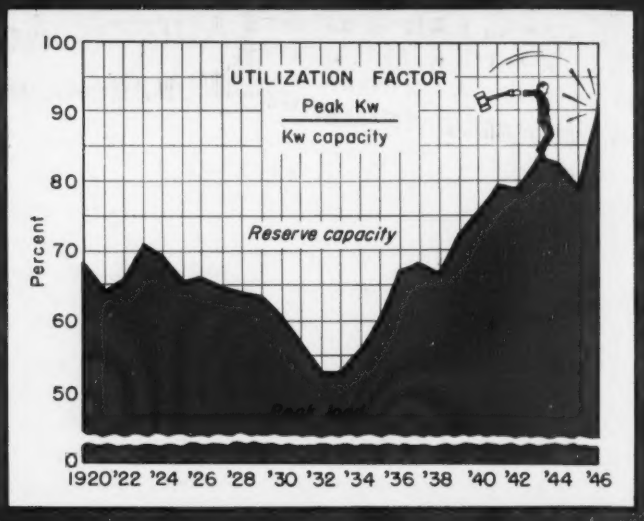
Here is the beckoning finger of opportunity. It is opportunity larger than is offered by even the most diligent and enthusiastic carrying-out of the program by any one electric utility. A utility that adopts and works the program can count on an accomplishment proportional to the measure of its own intelligence and effort. But the accomplishment is proportional also to the extent of the program's acceptance and execution by the whole utility industry.

Planned lighting, the statement in two words of the idea that the utility could sell to its customers an appreciation of the necessity for engineering design of modern lighting, was born in Pittsburgh. Under the forceful and inspiring direction of its originator, Joseph S. Schuchert, planned lighting built load and revenue for the Duquesne Light Co. and earned the approval of the company's customers. Much has already been accomplished by planned lighting in Pittsburgh by the work of the one company. But much more, a great deal more, will be accomplished in that city when planned lighting becomes a nationally accepted idea.

Of course, the basic idea of planned lighting did not originate in Pittsburgh. For many years power companies have been offering technical assistance in lighting to their customers, advertising that service and urging customers to use it. Some did a good job, some did a poor job; but most were at least making the motions. And each did things its own way, using or not using the numerous and varied sales and promotional helps available from the Edison Electric Institute, from the Better Light-Better Sight Bureau and from individual lamp and equipment makers.

Now planned lighting has been set up in a program offered for nation-wide acceptance. In this program lies such opportunity for enterprise as has never before been offered in the business of electricity supply. It is opportunity for the electric utilities to demonstrate that as privately owned business seeking legitimate reward for effort, they will bring a far greater benefit to the people of the nation. It is opportunity for profit through service in the American way.





THE HISTORY OF THE INDUSTRY appearing in these two graphs does not tell what levels of load and plant factors are just right for economic well-being and operating comfort. But it does say that neither is right at present. And with plant factor now being brought down by high cost investment, it certainly seems that every effort should be made to reverse the apparent downward trend of load factor. That means selling

Why Sell Lighting Now?

RALPH P. WAGNER
Chairman, Commercial Division
Edison Electric Institute

WHY SHOULD WE SELL electric service now when almost without exception utilities find themselves with less reserve capacity than is desired to insure continuation of the high quality of service they have always given? Why sell when the delivery of a turbine is 20 to 40 months from the date an order is placed? Why spend money for a sales force to sell something that sells itself?

Why? Because we had a 1929 and because the inexorable law of supply and demand has an unchanging way of catching up with things. The day will come, and sooner than many of us realize, when we will have more capacity and *less* load. When that time comes, management will want sales and want them intensely. A high-load-factor, non-slipping, non-skidding load will be needed and needed badly. What load is there which will stay with us in the lean as well as in the fat years and what load has a high load factor and what load best promises a return on these new turbines purchased at 1947 prices? One and only one such load exists—that load is lighting.

Two years from the time a lighting salesman is hired, he may begin to put lighting on the lines in a profitable manner. So, today is none too early to start the lighting department on its way to meet the coming problems. Perhaps it is too late even now for salesmen to do more than avert partially the day of decreasing loads and decreasing revenues.

With this very definite need for prolonged training on the one hand, we are faced on the other with a situation in lighting that demands the utmost in speedy, energetic action from all of us —a situation that many expect will have a serious effect upon this mainstay of our industry. The people want fluorescent lighting. It is up to the utilities to see they buy the right kind.

SECURITY OF LIGHTING REVENUE

Lighting offers greater security in steady revenues, during periods of declining customer purchasing power. Rate engineers know that lighting brings sales at higher blocks of their rates. Commercial managers remember that lighting is by far the best means to build minimum bill users into more profitable customers.

I believe that the E.E.I. Planned Lighting Program is the answer—that the company putting the program into operation in its area will receive a greater return from its lighting promotion dollar more quickly and with more permanent results, than from any other type of promotion. I believe, too, that the time to begin planning and preparing for this activity is now. The Planned Lighting Program will be ready to go this fall and its use will prepare the way toward acquisition of new profitable loads for the day when they will be vitally needed for the industry's welfare.

The public is not sold by one salesman's call, or by one campaign. Changes in public opinion trends are accomplished only through long-term, aggressive action by an entire industry, which eventually results in public acceptance. Those executives who attempt to settle all other problems before considering lighting promotion may find that it is then too late.

Why sell? Why sell now?

Sell to protect your profitable markets from the salesman who sells fluorescent lighting to reduce the lighting bill. Sell to get profitable load for your new turbines purchased at the gilt prices of 1947. Sell to protect your customer from inadequate lighting. Sell to protect your earnings statement in the time that will surely come when business will not be as good as it is now.

Kansas Adds 606 Kw. of Commercial Light

our salesmen made 534 surveys and 340 recommendations and added 606 kw. of lighting with an E.A.R. of $33,457. Aside from the immediate tangible new revenue secured from this campaign is the number of

Lighting Adds 90 Watts to Low Users

By B. E. Marsh

Residential Sales Manager

The portion of time and expense charged to home lighting resulted in an operating cost of only 48 cents for each $1 of revenue, a

A Cost Study of the Home-Lighting Operation of Six Operating Companies

Four-Point Program Adds 11-Cent E.A.R.

E.A.R. added	$70,977.00
Gross cost per dollar E.A.R.	$0.362
Net cost per dollar E.A.R.	$0.182

Record of Lighting Sales Promotion

Two Engineers (C.V.P.S. and allied T.S. companies)

Year	Commercial E.A.R.	Lighting Expense	Cost per $1 E.A.R.
1936	$13,723	$4,[illegible]	33.7 cents
1937	13,557	4,[illegible]	34.0
1938	14,145	5,050	35.7
1939	16,782	4,842	29.0

Revenue increase	79.56
Aver. added revenue per customer (3 mos.)	1.59
Value per kw. per year	44.48
Revenue per kw.-hr.	0.0336
Aver. kw.-hr. increase per customer per month	16
Aver. added revenue per year (31 per cent in first quarter)	$5.12

these new ideas show an average gain of 27 per cent in kilowatt-hour sales.

Add $44,000 in E.A.R.

Service Class	E.A.R.	Quota
Lighting	$25,277	115%
Air conditioning	3,754	187
Refrigeration	5,350	200
Counter cooking	5,316	231
Other services	5,570	213
Total	$44,267	147%

Home lighting expenses less merchandise profit	3,119.50
Cost per dollar of estimated annual revenue to produce business	0.42

Use Specialized Selling to Build Lighting Load

As a result of this method of selling, we secured 39,737 kw. of new and additional load in 1939. In the first five months of 1940 we have secured 17,696 kw. of new and additional load, as compared to 13,670 kw. in the first five months of 1939. This is an increase of 4,026 kw., or 29 per cent.

30% of Low Users Buy 7,000 Lamps

By M. N. Waterman

Lighting Advisers Recover Revenue

By J. M. DALY

Co-operating Dealers Sell 23,055 Lamps

By Patrick Johnson

Pacific Gas Adds $4.21 of E.A.R. per Dollar of Sales Cost

You Want Evidence?

THESE BITS FROM THE PAGES OF ELECTRICAL WORLD prove that before the war it was profitable for utilities to promote and sell lighting. Also that it was a good way to make friends. And doesn't the industry want friends and profits now, the same as then?

256,000 SCHOOLS
need 7 times the light
they now have

100,000 OFFICE BUILDINGS
need 5 times the light
they now have

200,000 FACTORIES
need 4 times the light
they now have

Lighting Education Is a "Must"

HARRY RESTOFSKI
Chairman
Better Light—Better Sight Bureau

WE ARE ON the threshold of the greatest opportunity for lighting progress since the advent of electric illumination. What we do with that opportunity depends largely on one thing—that is how good a job we do of educating people on their need of Better Light for Better Sight. Only to the extent that there is understanding of this need can the long overdue revolution in lighting practice be brought about in homes, schools, offices, and factories. The problem is just as simple as that.

In homes people are using only one-fourth as much light as they should. Light sources are inadequate in number and lighting quality is low. Lighting equipment is often bought primarily for its decorative effect, only occasionally because of superiority in providing better lighting for seeing. The reason is that people just don't know any better, are satisfied with their lighting. In homes people will want substantially better lighting only when they understand the hard work eyes do in reading, studying, and sewing; when they realize that their eyes and those of their children can be injured by faulty lighting; when they know that old eyes need more light than young eyes. It's time to speed up the work of bringing about that understanding.

An important but neglected place where there is a crying need for better lighting is in schools. Learning is predominantly a job for eyes, and sixty million of them are hard at work in our schools. Of course, progress is being made in relighting schools, but that progress is slow considering that, on the average, schools have only one-seventh enough light. There is one primary reason for all this. Too few school officials, too few parents, and too few school taxpayers have any idea of the monstrous thing they do when they force young eyes to work hard under lighting conditions that prevail in most schools.

THE NEED IS GREAT

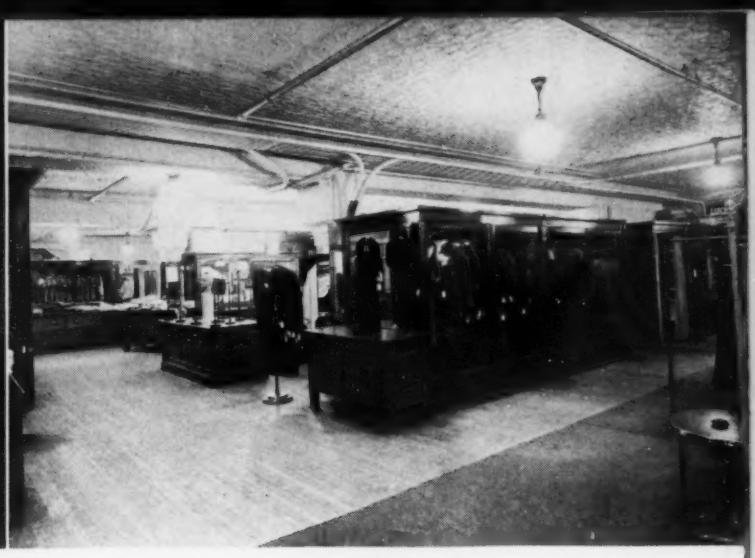
Office lighting has long been a neglected field. Some offices are so small they seem unimportant; some office buildings are so large that relighting is a big, costly job. Sometimes landlords are reluctant to spend money for relighting, and tenants are unwilling to invest in improvements to property they do not own. However, there are no really good reasons why office lighting practice shouldn't be much better. Better office lighting can be sold. It can be sold because it pays in decreased absenteeism, speeded-up work, decreased errors, and increased employee satisfaction with the job.

Only a small fraction of industrial plants have really good lighting, despite the progress made during the war when a few hundred modern war plants were correctly lighted and received tremendous publicity. Lighting levels in factories, on the average, are only one-fourth what they should be. Why? Because plant operators don't know that merely being able to see is not enough. They don't know that good lighting, which makes seeing easier, is one of the best improvements they can make because it increases production and safety, and decreases spoilage.

The Better Light-Better Sight Bureau is hard at work through its committees, its headquarters, and its advertising agency to create and make available the lighting educational materials that are the foundation on which better lighting will be sold in most fields. Store lighting is the principal exception. Here the opportunity for progress is just as great as in other fields, but better light is sold for better selling rather than for better sight.

The Planned Lighting Program is expected to be a success by all participating in it. Its success can be doubly assured if all participants are farsighted enough to do the necessary ground work of lighting education.

30,000,000 HOMES
need 4 times the light
they now have



1,775,000 STORES
need 6 times the light
they now have

What and Why of Planned Lighting

J. S. SCHUCHERT
Chairman, Commercial Sales Section
Edison Electric Institute

FROM THE BUYER'S viewpoint, planned lighting will sell more goods, improve office work, help to educate students more effectively, increase factory production, aid young eyes, greatly increase the visual acuity of older eyes, calm tense nerves, make more comfortable homes —in short, will increase the happiness, improve the morale, add to the material gain of all people by serving their specific living, working and selling needs.

This is what good modern lighting will do for the users of it. It will also benefit those who provide it, will make more and better business for them. They can reap rich rewards by providing trained service facilities and by adopting efficient and effective marketing methods. They can do this by recognizing and acting on the proposition that if lighting is to be good, it must be planned, and that planned lighting must be sold.

The Planned Lighting Program for the Electrical Industry, to give it its full name, is sponsored by the Edison Electric Institute to make possible the sale and use of good modern lighting which will:

1. Provide the user with the best and greatest return on any investment he ever made.

2. Give to all branches of the industry—manufacturer, distributor, contractor and utility—material gain far beyond anything which they ever thought could be derived from this business.

The need for a cooperative program and coordinated effort is greater than ever before. Never since the change from gas or oil to electric light has there been such a tremendous opportunity. On the other hand, neither has there been such a threat to the user and seller of artificial light. Unless the lighting industry acts to prevent wasteful and disappointing applications of the new light sources and equipment, the opportunity will be lost. All branches of the industry will suffer and the greatest loser will be the user.

NOW, MORE THAN BEFORE

There always has been a need for planned lighting, but the need is greater now than ever before because:

1. New light sources, particularly fluorescent, and new equipment have complicated the engineering and application methods and have confused the user—the purchaser of new lighting and of lighting equipment.

2. The public wants the new types of lighting because they are new, modern, and up-to-date, because they represent the advanced way of doing things. Thus the market for lighting is greater than ever before.

3. Many irresponsible individuals and profit-hungry business organizations selfishly will attempt to sell the market "short."

The E.E.I. program includes many types of advertising and sales helps which are considered practical and effective by the talented experienced people from all branches of the industry who have worked so hard to produce them. Plan books, direct mail, consumer booklets, visualizers, layout forms, circulars, newspaper and radio advertising service, films, sales and technical training programs have been developed, assembled and coordinated in the most effective manner possible in order to sell planned lighting successfully to stores, offices, schools, factories and homes.

Millions of dollars will be spent on this program collectively by the E.E.I., the Better Light-Better Sight Bureau, NEMA, other trade organizations and by the various branches of the lighting industry. It promises to be the most elaborate and the most effective cooperative promotional activity ever developed in the electrical field—everyone working under the one banner, on the one theme of "Planned Lighting" and recommending the services of "The Man Who Plans."

TYPICAL PAGES FROM THE STORE-LIGHTING VISUALIZER by means of which the "Man Who Plans" shows the store operator the profit to be gained from modern lighting

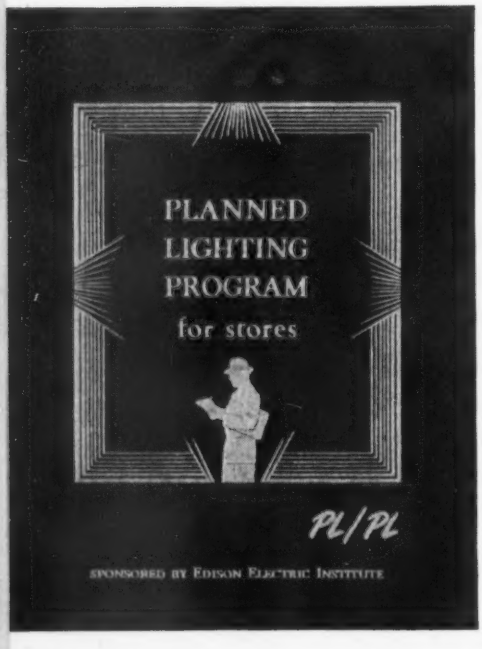
How to Sell Planned Lighting

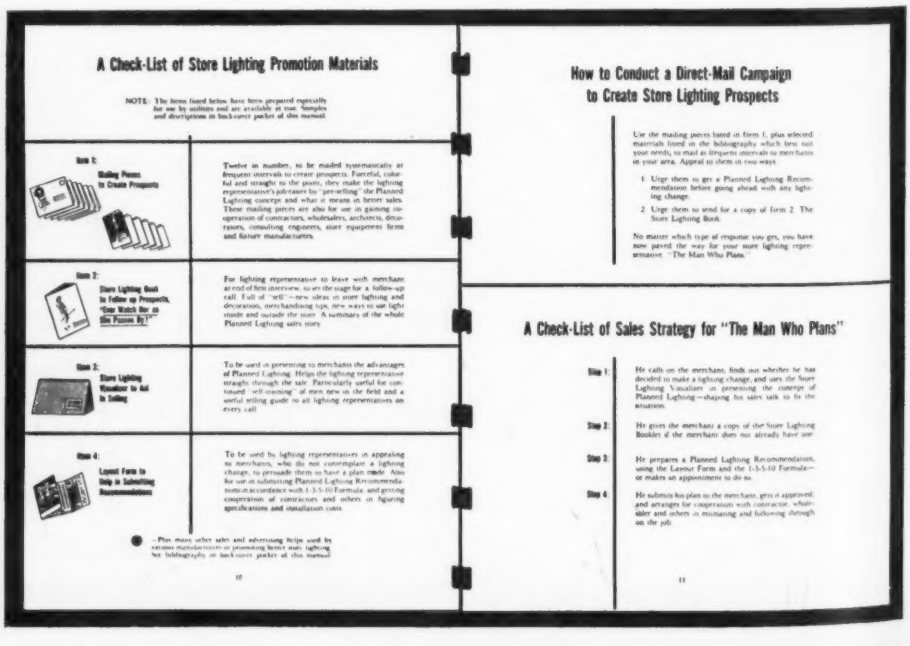
SPECIFIC INSTRUCTIONS on what to do and how to do it to obtain desired results from the Planned Lighting Program are contained in five plan books, one each on store, office, industrial, school, and home lighting. In a back cover pocket of each book are samples of promotional material—direct mail and handout pieces, small and large, simple and elaborate. Also included are samples of layout forms for lighting recommendations, descriptions of "visualizers" by means of which the values of modern lighting are shown to customers in personal calls, and bibliographies of films, publications and other sales helps.

An idea of the appearance and contents of the plan books and visualizers is given by the illustrations on this page. They are taken from the book on store lighting, the first one completed. The four others will be finished at different times through the summer, the whole program thus ready to go by early fall.

Arrangement of the contents of the five plan books is practically the same for all. First comes a discussion of the field, its particular characteristics and its market potentialities. Next are suggestions and check lists for organization of promotional and sales plans. Third are the samples of promotional pieces and sales helps available from the Edison Electric Institute and lists of additional material that may be obtained from the Institute or other sources.

In the discussion of the field that opens each plan book are set forth




A Check-List of Store Lighting Promotion Materials
How to Conduct a Direct-Mail Campaign to Create Store Lighting Prospects
A Check-List of Sales Strategy for "The Man Who Plans"

IS LIGHTING LOAD WORTH GOING AFTER? In the store at the left is a load of 15.7 kw., 4.6 in general and 11.1 in accent lighting .... And in the one at the right there is a total of 31.5 kw.

the considerations determining sales activity in the particular case. Here are stated the reasons why the electric utility should undertake the sales job —results of surveys showing utility opportunities and customer needs and benefits to both that can be realized.

The suggestions and check lists for the implementation of sales plans cover the whole gamut of organization and operation. Here are detailed instructions on how to select and train personnel; how to set up the sales organization; how to appraise and classify the local market for most efficient direction of sales activities; how to cooperate with other interests in the field; how to use promotional material and advertising to get most results from them.

To the competent sales executive much of the content of the plan books will be familiar. Some, perhaps, may call it "old stuff." But no man is so good at his job that he can't be better and every man can profit by studying again what he feels sure he knows. Also the plan books have that particular value that always results from the setting down in logical consecutive order the functions of organization and the steps of operation that are necessary for successful sales activity. Not even the most confident sales head can afford to brush these plan books aside, thinking he does not need them.

To Sell Store Lighting

THAT MOST MERCHANTS intend to modernize their places of business and that good modern lighting should be included in those intentions, is the opening theme in the store lighting plan book. If these merchants are not given competent advice, many of them are likely to install new equipment on a "current-saving" basis, thinking to take most advantage of the efficiency of the fluorescent lamp. Surveys of such installations show that at least a third should, and probably would, have about 2 to 5 times as much lighting if planned lighting recommendations had been presented to them.

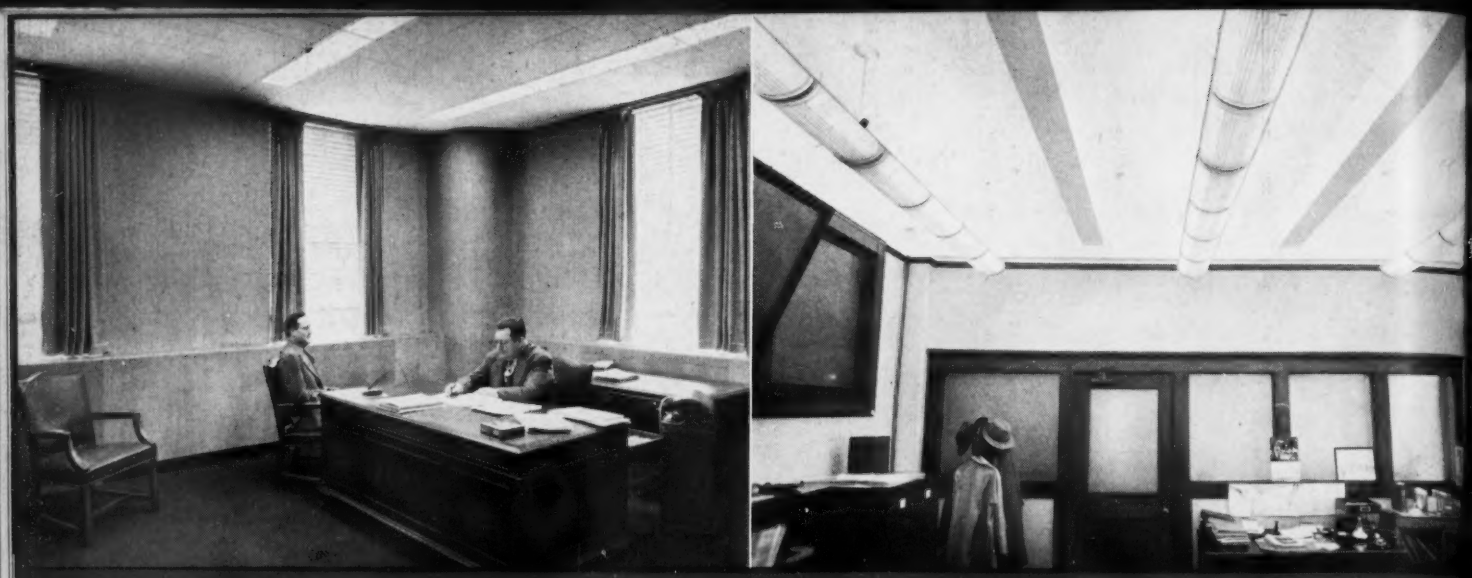
Figuring large in the plan book is the modern concept of store lighting, the 1-3-5-10 formula for determining illumination levels of circulation areas, sales areas, shelves and show cases, and high-attention spots, in that order, the second 3 times the first, the third 5 times and the fourth 10 times. Emphasis is also laid on the necessity for cooperation with lighting suppliers, contractors, architects, store equipment firms, and others concerned in store modernization.

The book includes four check lists. One lists and describes the many promotional pieces and sales helps available. Another tells how to carry on a direct mail advertising campaign. The third outlines the work of "The Man Who Plans" in his contacts with customers. The fourth details the creation and operation of a store lighting sales organization.

From One of the Plan Book Makers

There is substantial evidence from organized surveys and from general observation that planned lighting promotion will pay out in increased revenue. Most merchants intend to "modernize" their lighting. Unless it is planned for them, their "modernized" lighting is likely to be unsatisfactory to them as well as to the utility. To avoid this, the Planned Lighting Program was organized.

H. B. Gould, Ohio Edison Co.



IS LIGHTING LOAD WORTH GOING AFTER? In this office there is a load of 1,800 watts in well-designed fluorescent lighting . . . About 5 watts per square foot is the load of Slimline lamps in this small office at the right

To Sell Office Lighting

SOME KIND of New Lighting is going to be sold and installed, and probably soon, in hundreds of offices in the service territory of every electric utility. Will this market be left, asks the office lighting plan book, to the irresponsible peddler selling fixtures only? Or will the utility, cooperating with responsible suppliers and contractors, see to it that the right kind and amount of lighting is installed in the right places in these offices?

Starting from there, the book recites the benefits of planned lighting; to the customer in terms of improved efficiency and morale of office workers and of increased use of office space; to the utility in retention and building of load and in bettered customer and trade relations. Then comes a statement of the four basic steps in selling office lighting; (1) show the need for it by pointing out the deficiencies of present lighting, (2) show how the deficiencies will be corrected by a planned installation, (3) prove the point by the evidence of results from planned lighting jobs previously done, (4) establish the value by weighing cost against benefits.

Inform, create and cooperate. These are three imperatives stated by the plan book for successful activity in office lighting sales. Inform potential buyers of the advantages of expert recommendations and planning for best utilization of modern lighting facilities. Create a competent sales organization, one capable of coping with the different problems of every kind of customer and every kind of office. Cooperate wholeheartedly with all concerned, particularly with the electrical contractor whose business is largely increased by successful office lighting promotion.

Finally, the plan book exhorts to action at once, using the tested selling tools available in the Planned Lighting Program, so that the customer gets fullest value from the resources of modern lighting.

From Another of the Plan Book Makers

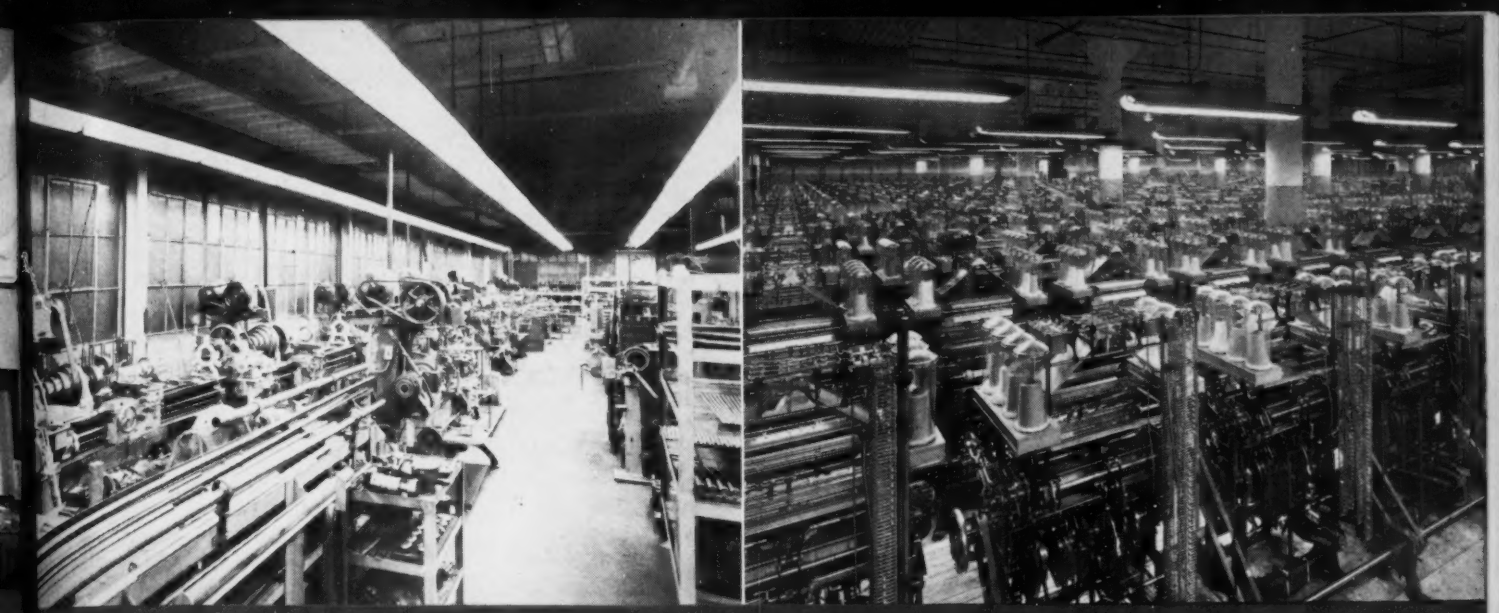
The potential market for office lighting totals over 1,150,000 kw. of new load. In normal use of lighting in offices, this means the sale of an additional 1,725,000,000 kw.-hr. annually, which at only 2 cents per kw.-hr. results in a revenue increase of $34,500,000. But no utility can expect its share of this increase just to fall into its lap. Competent salesmen, trained for the job and supported by vigorous promotion, will be needed.

R. W. Butts, The Ohio Public Service Co.

From Another of the Plan Book Makers

That the lighting load is basic and that lighting revenue is profitable are axioms of the electric utility business. It is also obvious that relations with customers and with the public generally are bettered by the brightening-up of streets, stores, factories, offices, schools, and homes that results from the intensive promotion and sale of good modern lighting. How, then, can any electric utility afford not to join up in the Planned Lighting Program?

J. M. Stedman, Pennsylvania Power & Light Co.



IS LIGHTING LOAD WORTH GOING AFTER? In this machine shop the lighting at left approximates 5 watts per square foot . . . About 15 kw. in this hosiery knitting room at the right

To Sell Industrial Lighting

TRULY REVOLUTIONARY developments in industrial lighting methods, and the results obtained by them, have created a demand that must be met by capable, prepared utility management, asserts the industrial lighting plan book. The market is larger than ever before. From 249,000 factories on V-E day, the number rose to 296,700 in September, 1946, and is still going up. Surveys show that one-third or less of the floor space in these shops and plants is lighted to recommended A.S.A.-I.E.S. standards. Lighting of the other two-thirds must be increased 2 to 5 times for productive seeing conditions.

Relighting of industrial plants is practically a continuous process. One area in a factory gets improved lighting; then another department needs it; then a new lighting development comes along and restarts the cycle.

Planned industrial lighting sells improved lighting in other places. It convinces workers of the need for good home lighting, attracts them to well lighted stores, interests them in proper lighting in the schools their children attend, and makes easier the sale of street and highway lighting.

An electric utility has definite economic and social responsibilities to the people and the industries of its service territory. Promotion of planned lighting in industrial plants helps greatly in those responsibilities. It contributes much towards maximum production efficiency; reduces waste of materials and space; improves protection against accident and injury; and makes for a happy, healthy employee attitude in clean, bright, pleasant surroundings. These benefits spread out from the industrial plant, are reflected throughout the territory, and thus a sales activity in one field of planned lighting is transformed and expanded into major benefit to the whole community.

From Another of the Plan Book Makers

It is not unusual for 40 percent of the connected load of a modern factory to be lighting. And in such a modern factory the lighting will generally be used all day every working day without regard to season or weather. Thus planned lighting works for the utility in revenue as well as for the customer in quality and quantity of product.

Maxwell Cole, Philadelphia Electric Co.

From Another of the Plan Book Makers

Today, the industrial lighting market is larger than ever before. This is because there are more working industrial plants—more, even, than there were on V-E Day—and only one-third of the space in them is lighted in conformity with recognized modern standards. In the war years, good lighting demonstrated its effectiveness as a production tool. The lesson of that demonstration must be applied by manufacturers who hope to make profits in the competitive days ahead. They will need help in this. And they can get no better help than from utilities cooperating in the Planned Lighting Program.

B. J. Jensen, Public Service Electric & Gas Co.

IS LIGHTING LOAD WORTH GOING AFTER? This school auditorium was converted into a study hall. The lighting totals 6.4 kw. . . . And here's a room in a rural school (right) in which 960 watts are installed

To Sell School Lighting

A NEED, A CHALLENGE, a responsibility, and an inspirational assignment — that is school lighting, according to the plan book for that field. Although the direct benefit to the utility is not as large from school lighting promotion as from other lighting sales activities, the indirect benefits are endless, because the schools are a cross-section of the entire community.

According to the census, 30,525,000 people—students, teachers and others—were the school population in 1940. Since then the number is estimated conservatively to have risen to about 36,000,000. Classrooms, study halls and laboratories of various kinds total over 750,000,000 sq. ft. of floor space.

To the electric utility, planned school lighting means fulfillment of a community responsibility with enhancement of prestige and good will. It means the establishment in young minds of lighting standards whose effects will be apparent in improved home, office, industrial, commercial and street lighting. It means additional revenue, dependable, year in and year out.

Through the '30's it was difficult for schools in many communities to obtain funds for building programs, for reasonable salaries for personnel, or for modernization of facilities. The schools felt the general economic pinch. During the war schools were taxed to capacity, but war demands siphoned off personnel, materials and community attention. For nearly two decades the basic educational establishment of the nation has had little or no improvement in structures and facilities.

To catch up on these arrears in school expansion and modernization is a long term job. It is being started now, and now is the time for modern lighting to become a part of it; later may easily be too late. As the single supplier of electric service in most places, the utility is almost under compulsion to raise standards of vision in the schools of its territory, thus to earn a large return in good will and to earn a reasonably increased revenue from a stable type of load.

From Another of the Plan Book Makers

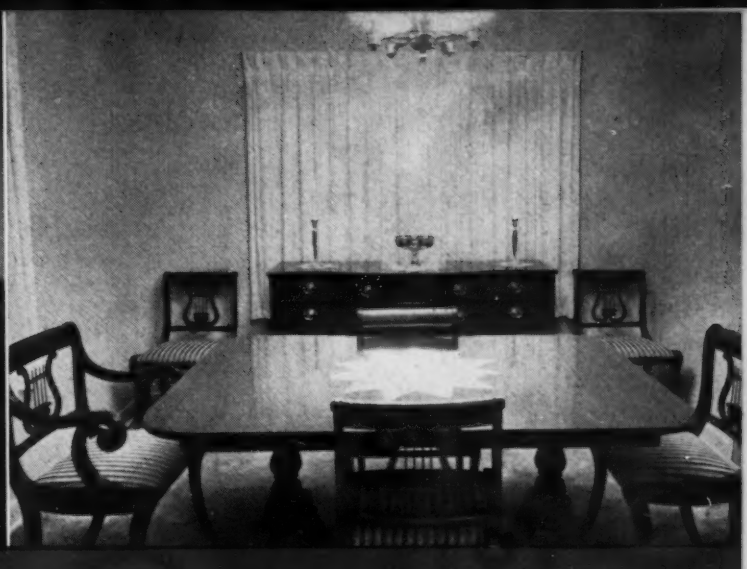
It is the electrical industry's responsibility to see that every room in every school enjoys the benefits of planned lighting. The manufacturers of lighting equipment, the wholesalers, the salesmen, contractors, and utilities will all receive, not only a monetary reward, but also the satisfaction of having contributed to the conservation of eyesight and the advancement of knowledge among those who attend our schools and universities.

C. C. Munroe, The Detroit Edison Co.

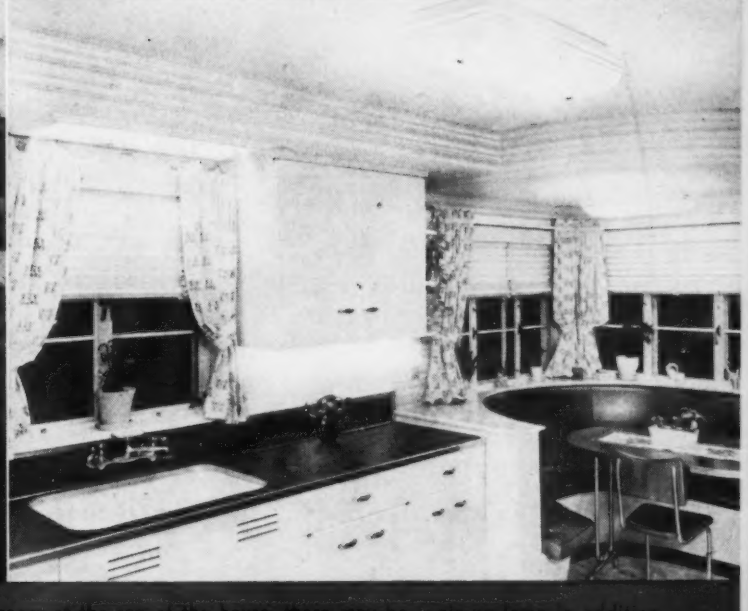
From Another of the Plan Book Makers

Planned lighting in industrial plants is a necessity, in my opinion. Lighting is a production tool, just like a milling machine or a lathe. Planning is the only way for the customer to get from his lighting installation what he wants in quality improvement and output increase of his product. And don't forget that when the sales engineer plans a planned lighting job, he is also planning an increase in revenue.

Charles Snyder, Monongahela Power Co.



IS LIGHTING LOAD WORTH GOING AFTER? The adequate, comfortable lighting in this living room totals 600 watts . . . It all adds up; the 300 watts in this small dining room increases the total load in the house



IS LIGHTING LOAD WORTH GOING AFTER? In the average room of the son of the house, there may be a pin-up lamp in addition to the light in the center of the ceiling. Here there are six portables and fixtures, totalling 570 watts . . . When fluorescent goes into the kitchen, from many times it's 20 or 40 watts . . . In this kitchen plan load is 285 watts . . .

To Sell Home Lighting

WHAT'S AHEAD for home lighting? Nothing short of a revolution, says the home lighting plan book. Homemakers want better light and more of it. They know, or soon will learn, that new light sources, new lamps and fixtures, are now obtainable, and that new lighting techniques are being used to create a home environment consonant with ideas of modern living.

Lighting has not yet begun to take its rightful place in the home. Technically, its progress has been fast in recent years, but little of that progress is apparent in home life. Today's average wired house has 26 lamp sockets representing a connected load of 1,250 watts in lighting. The average should, and easily can, be 5,000 watts.

The plan book gives estimates of what can be accomplished by aggressive selling of planned home lighting in the next five years. Completely new planned lighting can be installed in 10 percent of homes. Substantial improvements in lighting can be made by 50 percent, and minor improvements by 30 percent. This market potential can be stated as a possible average increase of 315 kw.-hr. per year per residential customer.

Planned home lighting is a long range promotion job. It is a new idea that must be sold from the beginning and that will require time for public acceptance. Once established, however, it will return continuing dividends in increased basic load and customer good will. The utility must be the backbone of the promotion; no other agency has so much to gain from it—or to lose if there is no, or ineffective, promotion.

The job is in two parts, mass educa-

IS LIGHTING LOAD WORTH GOING AFTER? This living room is not over lighted, but the load is over 1,000 watts . . . The planned 120 watts in this kitchen might have been an unplanned 40 or less

tion and specialty selling—build the market and supply it. Because the home is a mass market, the methods and materials for development of it, as set forth in the plan book, are rather different from those detailed in the programs for other lighting fields. More people are required for the personal contacts with customers. More sales outlets have to be inspired, helped and directed and their personnel trained. More and different kinds of promotional material and of sales helps are required. All of these considerations are discussed in detail.

For instance, a specific suggestion of the plan book is that "Sunshine Shops" be set up in the stores of as many retailers as possible. The functions of these shops are to stock bulbs and tubes, fixtures and portable lamps, as are desirable for modern home lighting; then to display these elements together in such way as to show to the home maker that it is not just one lamp or fixture that brings good lighting, but a happy combination fitting the particular case that produces the desired results. The idea is to adapt to home lighting the same kind of sales philosophy that has been successful in making women want electric kitchens, not just a refrigerator or a range.

The electric utility is the only agency that can swing the big job of modernizing lighting in the homes of the nation. Just as the homemaker was educated by sales promotion to buy the 101 other things that contribute to health, happiness and better living, so can she be educated to buy planned home lighting.

From Another of the Plan Book Makers

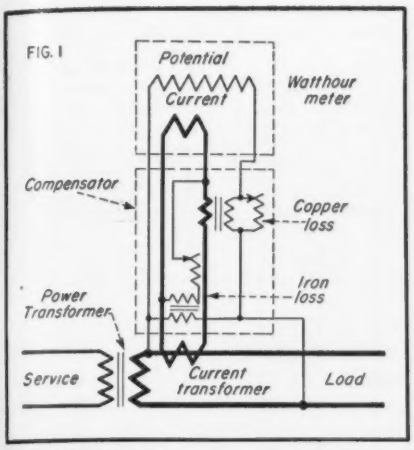
The planned home lighting program is based on surveys of the market, of manufacturers of lighting equipment, and of leaders in home lighting sales. The conclusion from these data and opinions is that leadership in the program should be taken by the electric utilities in their local areas. To them it offers high profit load and a unique opportunity for better customer relations.

H. A. Stroud, Monongahela Power Co.

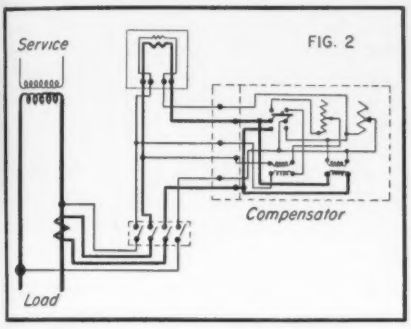
From Another of the Plan Book Makers

Estimates indicate that aggressive promotion of planned home lighting over the next five years will result in complete installations of modern lighting in one out of ten homes, in substantial improvement of lighting in one out of two, and in minor improvement in one out of three. That's a real market. To realize on that market, utilities must teach their customers to think of lighting planning and investment in terms comparable with bathroom fixtures, furniture and decoration.

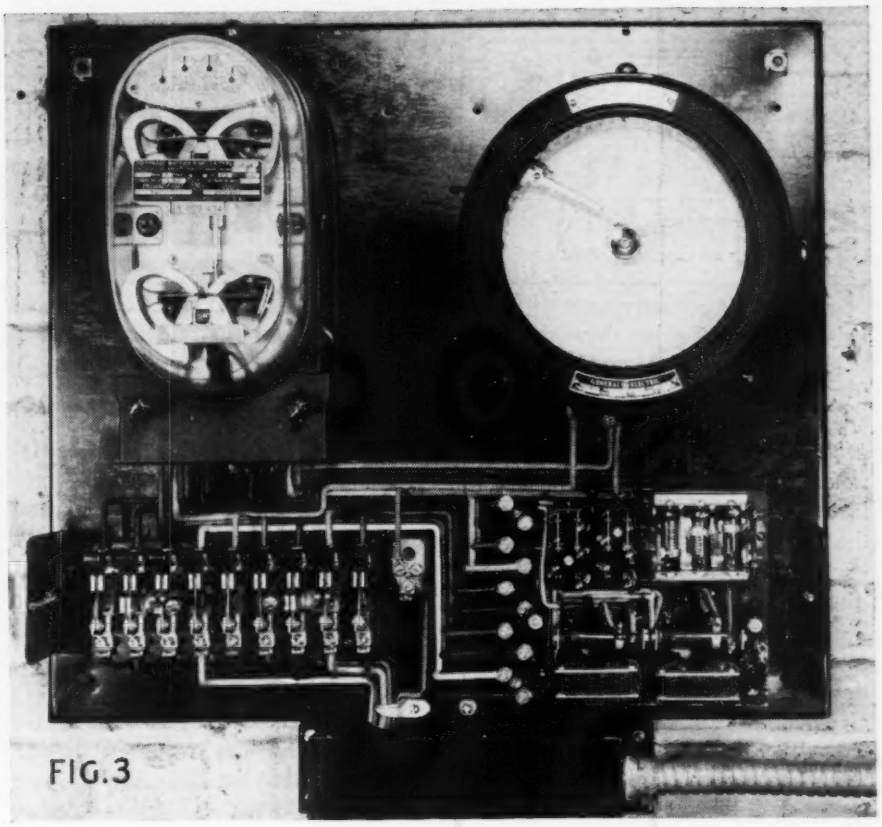
C. A. Stevens, Public Service Electric & Gas Co.



CONNECTIONS of a transformer-loss compensator on a single-phase circuit



TYPICAL two-element meter panel with recording demand meter and transformer-loss compensator at right



TWO-ELEMENT METER with graphic demand meter and transformer-loss compensator

Compensated Transformer Loss*

GEORGE B. SCHLEICHER
Meter Division
Philadelphia Electric Co.

Practicable method for registering consumption along with both copper and core losses incurred in power transformer supplying load at stepdown voltage . . . Data for instrument burden and routine watthour meter tests

TRANSFORMER-LOSS compensation for the range of conditions characteristic of metering on the low-voltage side has been designed for service supplied at distribution or transmission voltages. No changes are made in the regular watthour meter, either in construction or in method of adjustment. Demand as of the high-voltage side introduces no complications where a single transformer bank is installed. Procedures have been developed to permit both the initial calibration and routine maintenance to be done by metermen capable of handling corresponding installations on the high-voltage side.

In transformer-loss metering, the line-drop compensator principle is used for adding copper-loss increment to the registration of the load watthour meter. The burden imposed on the instrument transformers has been made sufficiently small to be acceptable for metering installations by designing the insulating transformer to step down rather than with the 1/1 ratio used in commercial forms. The ratio of 5.0 to 0.5 amp. has been found satisfactory, but its exact value is unimportant when the method of adjustment described in this article is used.

Commercially the copper-loss transformer is a 5-va., 1-volt 5-amp. to 10-volt 0.5-amp. unit, designed to be capable of carrying 100 percent overload continuously. The 0.5-amp. side is connected to an adjustable resistor unit for which a value of 5 ohms has been found to meet the general range of requirements of commercial installations. For unusual conditions higher or lower resistor values may be used. The difference of potential across the resistor is added to the secondary line voltage and the combination is applied to the potential coil of the meter. As the voltage across the resistor is proportional to the current, the loss increment as registered by the watthour meter is proportional to the square of the current.

For measurement of the iron-loss increment the "dummy load" method is used. A 7.5-va., 230/6-volt trans-

* Adapted from paper presented before A.I.E.E.

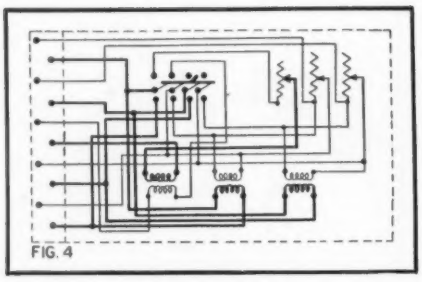


FIG. 4

INTERNAL CONNECTIONS of two-element transformer-loss compensator

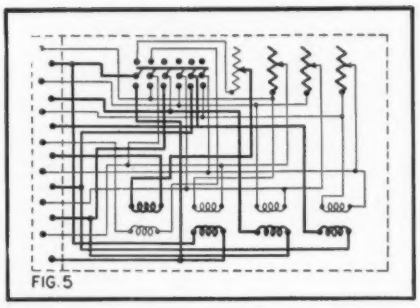


FIG. 5

INTERNAL CONNECTIONS of three-element transformer-loss compensator

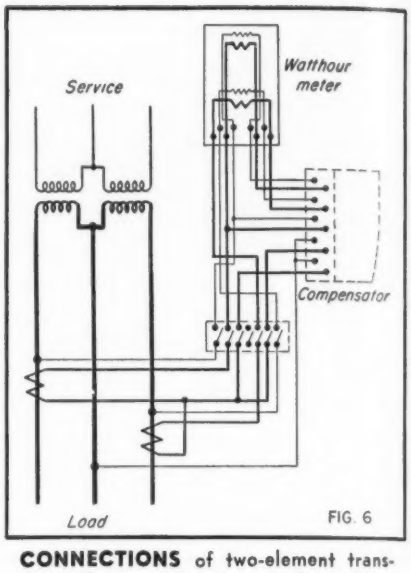


FIG. 6

CONNECTIONS of two-element transformer-loss compensator on three-phase, three-wire circuit (also two-phase, three-wire circuit)

former is connected to the low-voltage supply, and the 6-volt side is connected in series with an adjustable resistor unit so that a current equivalent to the iron loss is passed through the current coil of the meter. Ordinarily a 250-ohm adjustable resistor gives sufficient range, but units of higher or lower values of resistance may be used if necessary to obtain the desired performance. For 115-volt circuits, the transformer has sufficient capacity to be operated at half voltage. The compensator therefor may be used either for 230-volt or 115-volt installations, or on the secondary of potential transformers.

The assembly, together with a double-throw test switch and a terminal block, is intended as an accessory to the watthour meter and its connections to a single-phase circuit on the low-voltage side of a transformer bank are shown in Fig. 1.

For Polyphase Metering

For polyphase circuits duplicates of the single-phase unit may be used, but it is more practical to provide polyphase transformer-loss compensators. Two arrangements meet all requirements, one for use with two-element meters, the other for three-element meters. It is practical to add the entire iron loss on one meter element, hence only one core-loss transformer is used in polyphase transformer-loss compensators. Internal connections are shown in Figs. 2 and 4. The connections of the compensator into two- and three-element circuits are shown above.

A transformer-loss compensator may be added to an existing installation which measures the entire output of a transformer bank on the low-voltage side. On such installations, however, there should be no means of disconnection between the low-voltage terminals of the transformer bank and the point where the meter potential transformers, or the meter potential circuits, are connected. This is necessary so that iron-loss registration may be obtained whenever the transformer bank is energized from the high-voltage side, even though the load may be disconnected.

Economy of using transformer-loss compensators is greatest for the higher supply voltages. The cost of a 460-volt or 2,300-volt metering installation compensated to the 33-kv. supply may be less than 30 percent of the metering cost at 33 kv. For a 13.2-kv. supply savings may be only 20 percent, while for a 2.3-kv. installation metered at 230 volts, metering at the supply voltage is frequently lower in cost. In the latter case an exception may occur where existing 230-volt metering can be used with only the addition of the transformer-loss compensator.

Economic advantage of low-voltage metering is reduced, and sometimes eliminated entirely, where more than one metering equipment on the low-voltage side is required in place of a single installation on the high side.

Metering Burdens

When a transformer-loss compensator is connected into the meter circuits, an additional burden is placed on the instrument transformers. Table I gives test results of burden measurements. Potential burdens are given for 115 and 120 volts for two extreme conditions of adjustment, representing respectively iron losses equivalent to 0.5 percent and 5.0 percent of the meter rating. Current burdens are shown at 5 amp. for various adjustments for copper losses from 0.5 to 5.0 percent of the meter rating. The values given for 1.25 percent of meter rating represent an average condition. With modern instrument transformers, the effect of adding these burdens will not require a re-test of the instrument transformers.

Loss Data

For calibrating a transformer-loss compensator for use with a watthour meter the following data is required:

(a) Iron loss at rated voltage.

(b) Copper loss at 75 deg. C. at rated full-load current.

(c) Voltage taps provided in the high-voltage or low-voltage side.

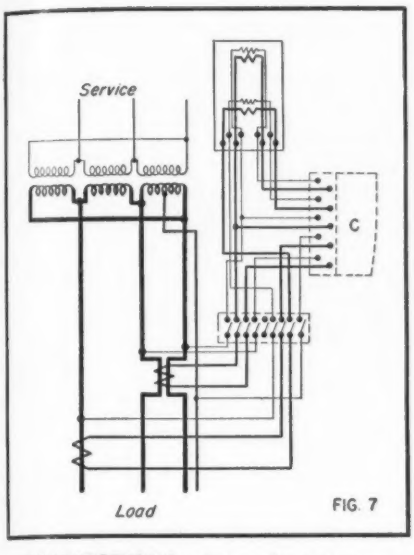
If power factor tests are intended to be made on the low-voltage side, or if a var-hour meter is to be calibrated, additional data is required.

(d) Percent exciting current at rated voltage.

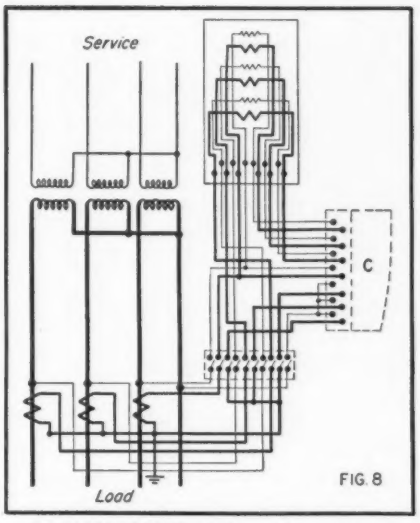
(e) Percent impedance.

From the installation itself data is obtained relative to the length, size and material of the conductors from the low-voltage side of the transformer bank to the metering point. For most types of construction, the metering point is where the *potential transformers* (or the meter potential circuits) are connected to the circuit.

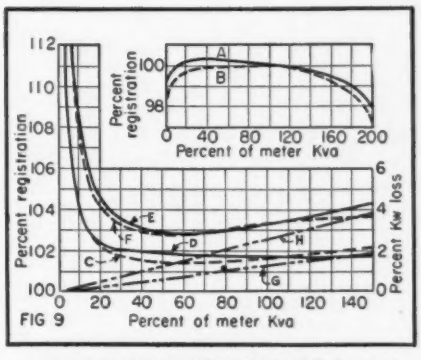
The iron and copper losses are calculated for full load on all elements of the meter at power factor 1.0 because this is the load at which the heavy load test of the meter is made. These losses are calculated in percent of the kw. load at which the meter is tested. For a polyphase meter at the heavy load test point this is the product of the number of elements of the meter and the kva. rating of each element. The percent losses for any other test



CONNECTIONS of two-element transformer-loss compensator on three-phase, four-wire delta circuits



CONNECTIONS of three-element transformer-loss compensator on three-phase, four-wire Y-connected circuits



SERIES TEST PERFORMANCE (including loss characteristics of two-element watthour meter with transformer-loss compensator on a 1,000-kva. transformer bank)

A. Accuracy characteristic of watthour meter, p.f. = 1.0
B. Accuracy characteristic of watthour meter, p.f. = 0.5 lagging
C. Percent total loss, p.f. = 1.0; also desired performance, p.f. = 1.0
D. Actual performance, p.f. = 1.0
E. Percent total loss, p.f. = 0.5 lagging; also, desired performance, p.f. = 0.5 lagging
F. Actual performance, p.f. = 0.5 lagging
G. Percent copper loss, p.f. = 1.0
H. Percent copper loss, p.f. = 0.5 lagging

load may be calculated by proportion. While copper losses vary as the square of the load current, *percent* copper loss varies *directly* with percent load on the meter. Therefore, it is simple to determine the percent loss for any load. For test loads at power factors other than 1.0, divide the percent iron and percent copper losses by the desired power factor.

Typical test results for a watthour meter and transformer-loss combination with the meter elements in series are shown graphically in Fig. 9. The insert in that figure shows test data for the watthour meter without compensator. The characteristics of the meter with compensator reflect, within the accuracy of the tests, the performance of the meter alone.

Tests in service on five actual installations showed the performance of the meters with loss compensators compared with the billing meters to range from 99.84 percent to 100.26 percent, with an average of 100.08 percent. This performance is well within the requirements of public utility commissions. The tests covered a period of 13 weeks, during which the total registration amounted to over 2,000,000 kilowatt-hours.

It happens occasionally that the operating tap on transformers is changed, or when the metering equipment is to be calibrated the tap to be used is not known. For the usual relations of losses the effect of a change of ±10 percent in tap voltage on a meter with loss compensator will be within ±0.1 percent at power factor 1.0 and within ±0.2 percent for power factor 0.5. Since these deviations are well within the permissible test limits to which watthour meters can be adjusted, actual recalibration of compensator is seldom necessary.

Initial Calibration

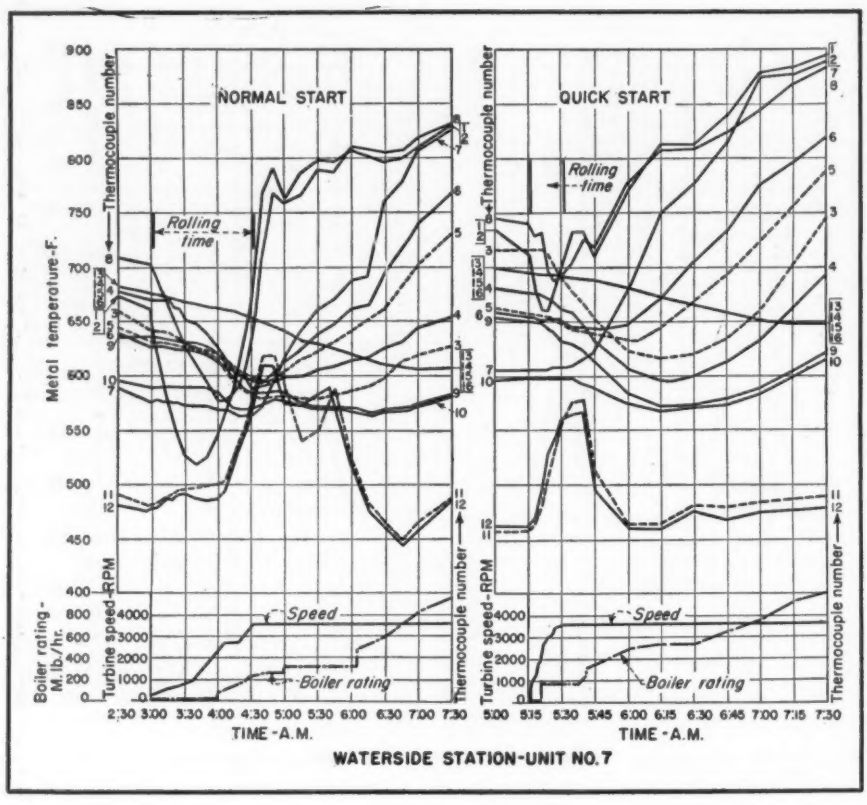
The compensator settings having been determined, the meter and compensator are connected for test. The watthour meter is adjusted in the usual way by placing the compensator test switch in the "test" position. When the test on the meter is completed, the compensator test switch is opened, which places the copper-loss elements in circuit. The copper-loss resistors of the compensator are adjusted at heavy load so that the loss is added equally on all elements. The compensator test switch is closed in the "normal" position which includes the iron-loss element in the circuit. Adjustment of the iron-loss element is made at the light-load test point. A final check should be made then with elements in series.

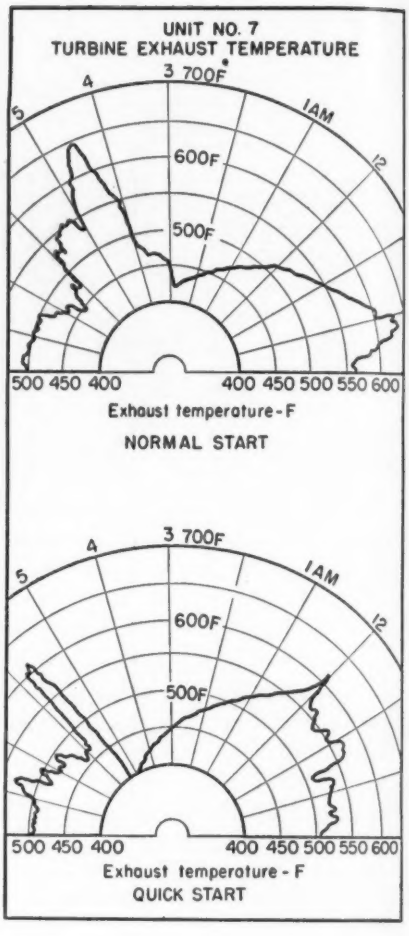
Operation of the compensator is automatic for changes in load power factor. Tests on the meter with compensator may be made on inductive load if desired. It must be remembered, however, that any deviation in power factor from the nominal value of 0.5 lagging will result in differences from the desired performance. For inductive load tests, therefore, it is important that the test results be compared with desired values for the power factor at which the test is made.

Tests in service follow the same principle. The "as found" accuracies with compensator related to what the meter should read is the accuracy of the combination. A test on the meter without compensator determines the need for adjustment either of the meter or of the compensator. The compensator performance is indicated by the difference between the results with and without compensator.

If the compensator requires adjustment, errors on the heavy-load test are corrected with the copper-loss adjustments, those at light load with the iron-loss adjustment. If inductive load tests are desired in the field, it is important to establish and correct for the true power factor of the test load as discussed under "initial calibration." The phase-angle of loading devices and possible variations in three-phase line voltages all have an effect on the true power factor of the test load.

Any method of meter testing may be used with transformer-loss compensators, but as the total loss curves are not straight lines, the tests with and without compensator should be made at approximately the same test load, and as closely as practicable to the nominal values of test load.





VARIATIONS in temperature from thermocouple readings show that quick start with controlled boiler pressure avoids cooling of steam chests during roll. Exhaust-end temperature remains high during normal start, down quickly with new procedure

Quick Turbine Starts Cut Costs*

New 20-minute technique saves fuel and labor over conventional hour-or-more warm-up . . . Turbine metal temperatures vary less than with former method

J. C. FALKNER
R. S. WILLIAMS
and
R. H. HARE
Consolidated Edison Co. of New York

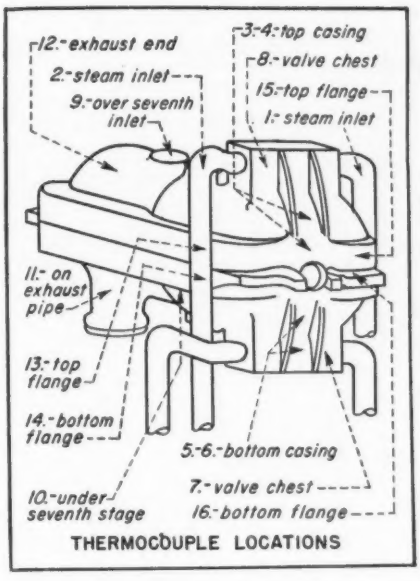
HIGH-PRESSURE steam turbines can be and are being quickly started after a "shut-down" period up to ten hours by admitting steam to the turbines at a temperature corresponding to that of the main parts of the turbine assembly. Extensive investigations recently undertaken at Waterside Station have shown that, where periodic operation is required, this technique reduces thermal "start-up" stresses in turbines and boilers, reduces starting fuel losses and personnel, and increases the available reserve factor compared with conventional methods. The quick-starting technique has also been found to reduce vibration at various points on the turbine and to eliminate completely the difficulty of bringing the unit through the period of critical speed.

* Condensed from a paper before ASME, Chicago, June 16-19, 1947.

The high-pressure equipment, upon which these tests were carried out, consists of four units, each comprising two boilers and one high-pressure turbine. The turbines exhaust into a common 200-psig. header which supplies steam to seven low-pressure condensing turbines and to two district-steam mains. The capacities of the boilers and turbines used in the tests are shown in the table.

The quick "start-up" procedure was developed in an effort to obtain minimum temperature differences between turbine and entering steam. The boiler is "bottled-up" by closing the induced-draft fan vanes, boiler stop valves, superheater and line drains, so that after an outage of six or seven hours boiler pressure is approximately 850 psi. At low steam flows from the boiler, the steam temperature can be readily controlled by varying the excess air.

As the first step, thermocouples were installed in the main leads to the turbine throttle, on the turbine steam chest, and at different locations on the turbine cylinder and flanges on all



THERMOCOUPLES at 16 locations check temperature changes in casing for comparison of quick-start technique with usual warm-up of large backpressure turbines

four of the high-pressure machines. The location of these thermocouples on one of the units is shown diagrammatically. Temperatures for normal starting at each of the test locations were recorded and the turbine speed and boiler output plotted at 30-minute intervals for each of the units. Subsequent analysis of this recorded material revealed that superheater and line drains were normally left open, so that boiler pressure, reduced to 200-400 psi. at the beginning of the rolling period, was gradually increased to approximately 800 psi. when the turbine was up to speed. It was also noted that the steam chests, with temperatures of 650-700 F. at the start, were cooled 50 to 120 F. during the first hour of the rolling period.

This is attributed to the low initial steam temperature and the length of the rolling period. When the generator was synchronized, it was found that the steam chest temperatures were approximately the same as at the beginning of the roll.

As a result of these experiments, test "start-up" procedures have been formulated for boilers and turbines in an attempt to hold heat in the boiler and to eliminate the cooling effect on the turbine by rolling it with steam at a temperature approximately the same as that of the turbine casing. This quick "start-up" procedure consists of the following steps:

(1) Hold normal drum pressure on both boilers, and take one off the line in the normal manner.

(2) When the rating is zero on the down boiler, open superheater drain until pressure falls to 1,000 psig. Then close superheater drain, fan vanes, boiler-stop or non-return valves.

(3) Drop rating on second boiler in normal manner to 300,000 lb. per hr., maintaining normal drum pressure.

(4) Notify control room that boiler is at 300,000-lb. per hr. rating.

(5) Trip both coal feeders on this boiler.

(6) Receive control room signal "Load Off" at 5,000 kw., and 1,000-psig. boiler pressure.

(7) Trip turbine throttle. (Keep turbine on turning gear).

(8) "Bottle-up" second boiler as prescribed in Step 2.

(9) If, during the outage period, drum pressure falls below 700 psi. on either boiler, bring pressure back to 850 psi. by intermittent coal firing.

Starting Up

(10) When turbine is to be started, note temperature of selected turbine casing thermocouple and record.

(11) Purge one boiler furnace, crack open superheater drain, light ignition gas, open superheater drain wide, put one coal feeder in service.

(12) Maintain steam temperature at superheater outlet as near as possible to the turbine casing temperature recorded in Step 10. (Regulation is obtained by adjusting the excess air.)

(13) Keep superheater bypass damper open.

(14) When boiler pressure is stabilized at 800-850 psi., open turbine throttle and roll turbine. Increase speed at rate of approximately 300 rpm. per minute.

(15) Place both coal feeders in service within 7 minutes after turbine rolls.

(16) Synchronize generator within 15 minutes after start of roll.

(17) Check turbine metal and inlet steam temperatures at frequent intervals during entire rolling period.

(18) Maintain both coal feeders at approximately minimum speed and keep superheater drain closed.

(19) During the rolling period, light off second boiler on line with superheater drain and bypass damper wide open.

(20) Regulate excess air to hold steam temperature of second boiler at same temperature as the first.

(21) Have both boilers at line pressure within 20 minutes.

(22) Regulate superheater bypass damper to increase steam inlet temperature at rate of 100 F. per hour.

(23) Load turbine normally.

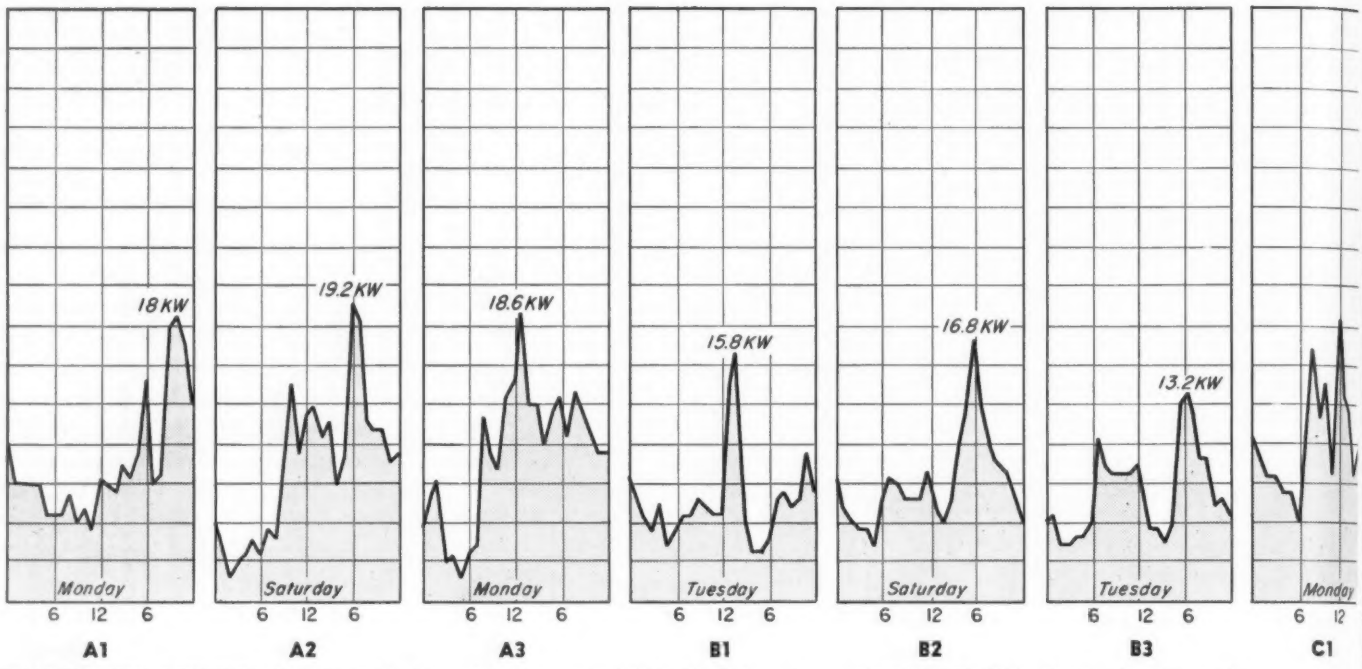
A complete set of data, using the quick "start-up" procedure outlined above, was taken for each unit after a five to seven-hour "shut-down." Graphs show the metal temperature changes during this method of starting for one of the units. From this, it can be seen that the cooling of the steam chest and heavy metal of the turbine casing was reduced considerably as compared with that of the normal "start-up," and that the temperature stresses were not increased. The 200-psi. turbine exhaust temperature charts for both types of starts are illustrated for the same unit. Of particular note in this is the length of time the exhaust temperature remains high for the normal "start-up" as compared with quick-starting.

Quick-starting also can be used on turbines taking steam from a main steam header, fed from any number of boilers and with other turbines running from the header, if desuperheating water is injected into the steam used for starting the turbine. Temperature of the inlet steam must also be held equal to that of the turbine inlet valve and casing for best over-all results.

Data on Waterside Units

Unit No.	Turbine Kw.	Manufacturer	Boiler Lb. per Hr.	Manufacturer
4	53,000	Westinghouse	500,000	Combustion
5	53,000	General Electric	500,000	Combustion
6	65,000	Westinghouse	615,000	Combustion
7*	65,000	General Electric	615,000	Babcock & Wilcox

* All temperature data shown in this article are for Unit No. 7, typical of similar data taken on other units. Operating pressure 1,200–1,250 psi., temperature 900–925 F.



TIME SWITCH CONTROL (A1, B1, C1), demand limiter control (A2, B2, C2), and no control (A3, B3, C3), of water heaters result in about same maximum demand at distribution transformer. Each curve is for day of highest demand for the control condition

Value of Water Heater

H. W. BERNING

Electric Meter Engineer
Central Illinois Public Service Co.
Springfield, Ill.

TIME SWITCH CONTROL of residence water heaters offers the one advantage, compared to uncontrolled operation, of shifting the time of the maximum demand in relation to the system load curve. No similar benefit is derived for the distribution facilities associated with the residential supply. Time switches set to keep the water heaters off the system peak have the disadvantage of creating a high demand on distribution at the time when all the heaters are permitted to become active.

The tests which led to these conclusions also indicated to us that better diversity on distribution loading is obtained with no control, and that demand limiters replacing the time switches at individual water heater services would serve the over-all purposes to better advantage. Ordinary maintenance of time switches does not give the ideal condition represented in the off-peak rate schedule, and actual operation may permit the water heater load to coincide with the other residence load peak. Demand limiters will overcome this objectionable feature.

Extensive Tests Made

Comparative data were obtained at three distribution transformers in different divisions of the company, and with the three types of control:

1. Time switch control as in use under the rate schedule.
2. Demand limiter control.
3. With no control (other than the heater thermostat).

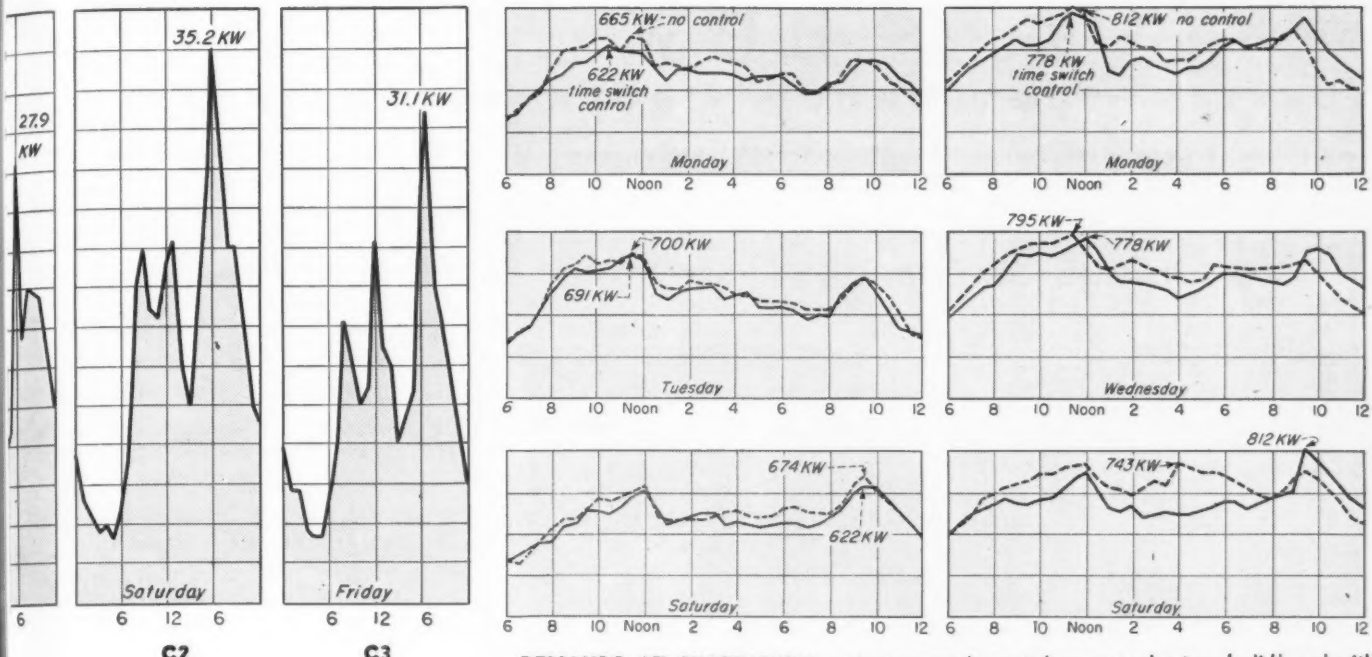
Saturation of ranges and water heaters in the groups of loads tested were relatively high, as follows:

Test	Customers	Ranges		Water Heaters	
		No.	%	No.	%
A	11	7	64	7	64
B	21	9	43	6	29
C	38	15	39	7	18

The accompanying load curves are, for each type of control, the loading for the day on which the maximum demand occurred. On the "A" group test the high percentage of water heaters caused 9:00 p.m. peaks, while maximum demands usually resulted from cooking load or a combination of cooking and lighting loads in the "B" and "C" areas (with some possible water heater load on top elements).

Diversity

With all control eliminated (except thermostats in the heaters) the pattern of load curve obtained is usually quite similar to that with demand limiter control. The diversity of demands among the group of customers served will usually result in no increase of maximum demand over that obtained with demand limiter control. Obviously, this would not be true if there was only one customer on the transformer, since in that case the water heater with demand limiter control



DEMANDS AT SUBSTATION, with time-switch control on water heaters (solid) and with no control on water heaters (dashed), one week later show little effects of control on maximum loadings

Time Control Questioned

Better diversity obtained without control . . . Demand limiters replacing clocks have advantages . . . Errors in timing control found high . . . Maximum demand shifts

would not be permitted to draw energy when the range was being used.

During the entire period of this survey there was maintained a record of monthly kw.-hr. consumption by individual customers. The usual seasonal variation was noted, but insofar as could be ascertained without more detailed analysis of customer's individual usage, there was no change which could be definitely ascribed to the change in the control device.

Substation Loading

Daily load curves for two substations were obtained and compared to the data for the entire divisions of which they are a part. Tuscola substation serves 1,942 customers with 16.1 percent having ranges and 5.5 percent having water heaters. Watseka has 1,438 customers with 27.9 percent range saturation and 7.9 percent water heater saturation. Two conditions were studied: (a) With all water heaters operating without control, and (b) with all water heaters having normal time switch control.

Curves for six days are shown in the accompanying charts. The maximum demand of 812 kw. on Tuscola substation was reached with each condition of control. When the water heaters were operating uncontrolled, the maximum demand was reached on Monday morning, whereas, with time switch control, the same demand was reached on Saturday night.

At Watseka the maximum demand during operation with no control on the water heaters was 700 kw., coincident with the maximum demand of the week for the division. With time switch control the maximum demand was 691 kw., and again was coincident with the maximum demand for the week for the entire division. For the Saturdays, both with control and without control, the maximum demand occurred in the evening at 9:30 p.m.

Time Switch Errors

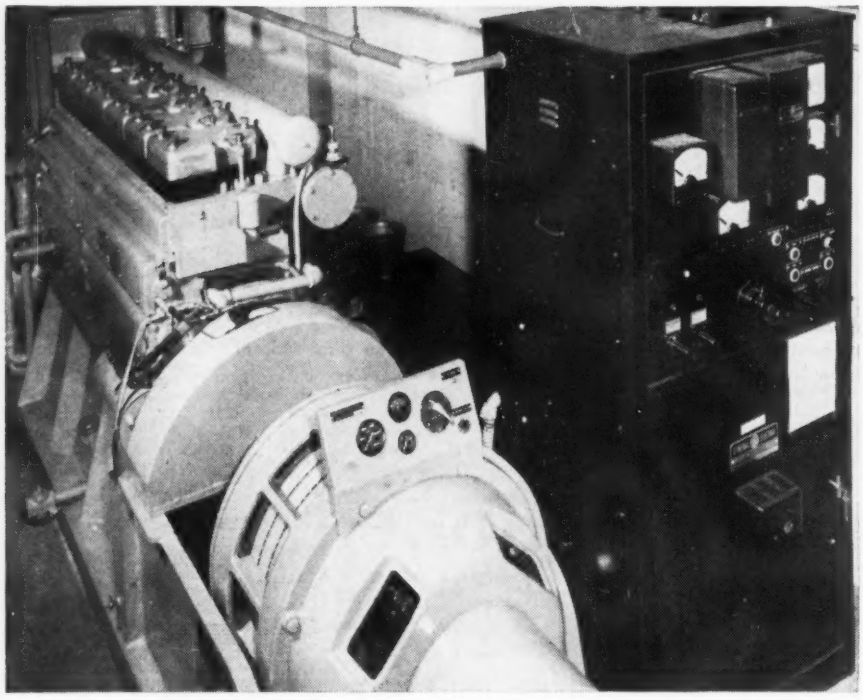
In each case, the time switches were set and inspected and known to be in accurate operating condition. Ordinary maintenance of time switches in service does not equal this ideal condition. A report of the conditions found is summarized below. Less than 23 percent of the switches were in condition to control the water heaters to within one hour of the rate schedule. It is our opinion that this figure is representative of usual maintenance schedules.

Total Switches inspected	219
Clocks within 1 hour	50
Clocks off time over 1 hour	118
Clocks stopped	51

HOW

DESIGN • CONSTRUCT • OPERATE • MAINTAIN

No Outage on Standby Throwover to Normal Power



150-KW. DIESEL EMERGENCY UNIT accepts full load within 10 sec. after power outage—special devices synchronize and return load to normal source without voltage interruption. Unit is mounted on Neoprene pads on waterproof floor

TWO NEW FEATURES of control applied to an emergency power supply engine-generator set should interest industrial engineers. Installed in the Federal Bldg., San Francisco, as emergency power supply for Naval communications, the unit consists of a 300-hp. Sterling Viking diesel engine driving a 150-kw. General Electric, 1,200-rpm., 120/208-volt a.c. generator.

A new control feature permits automatic re-transfer of load from emergency back to normal power source without voltage interruption. This feature involves momentary paralleling of the two-power sources by means of a special relay after the operator has satisfied himself that normal power supply will be maintained before leaving the emergency source.

Another feature is the provision made in the engine cranking control circuit whereby the initial application of reduced voltage to permit the starting motor gears to engage, followed immediately by full voltage to crank the engine, is done automatically instead of manually. This was accomplished through the use of a slow-flux-decay relay of the type frequently found in crane-motor control circuits. This relay permits an accurate time delay of ½ sec. between application of the 6 volts for gear engaging and the 32 volts for cranking.

Necessity of mounting the engine on an existing waterproof floor, into which no foundation bolts could be sunk, made it necessary to employ a deep-section rigid unit base and to distribute the dead weight over a large floor area. The generator set is not anchored, but rests on Neoprene pads.

The exhaust pipe is tied into the building incinerator stack, instead of being vented directly to the outside. An external separate stack would have been unsightly. Because of the absence of carbon monoxide this construction was permissible. Had a gasoline engine been used a separate stack would have been mandatory.

The installation was engineered and placed in service by King-Knight Co. Engineers of San Francisco.

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Equipment Modernized To Cut Fire Risks

TWO RECENT electrical fires investigated by the Associated Factory Mutual Fire Insurance Companies (Boston) emphasized the importance of using modern equipment of first-class design in circuit breaker applications for industrial plant service.

In the first, an operator was attempting to start a motor-generator set consisting of a 3-phase, 2,300-volt, 82-hp. motor driving a 120-volt, d.c. generator used for excitation of a 9,375-kva. generator. This was controlled by a non-automatic oil circuit breaker, a starting switch being located below the ceiling on angle-iron supports and near a platform carrying two oil-cooled auto-transformers. In starting, an arc occurred at the switch; internal pressure bulged the starting switch oil tank, and burning oil was expelled, setting fire to nearby combustibles and heating exposed surfaces. There was no interruption to production, as another motor-generator was available. A new starter of different make was purchased to replace the original

one, which was 38 years old, and the supporting platform, auto-transformers, and wiring used there were removed to avoid oil fire hazards.

The second case was a circuit breaker rupture due to a short-circuit in a 150-hp., 2,300-volt motor in which a bar in the end rings of an amortisseur winding broke, puncturing the winding insulation. The internal force broke two lugs on the circuit breaker cover, permitting it to lift slightly. Burning oil was forced out of this opening upon an adjacent circuit breaker controlling a transformer bank, damaging the breaker and the leads. Plant mechanics extinguished the fire with vaporizing liquid type equipment. Production in the finish mill department of the plant (a cement factory) was interrupted for three hours and 50 minutes, during which time 535 bbl. of cement would normally have been ground. The 150-hp. motor which drove a cement pump was replaced with a spare and a number of small motors supplied from the transformer bank, were again made operable after temporary repairs had been made to the fire-damaged circuit breaker. The breaker which failed was of an old type of doubtful interrupting capacity, and the insurance company recommended its replacement by a modern unit equal to present conditions, also advising that the condition and level of oil in circuit breakers of the plant be checked at least four times a year.

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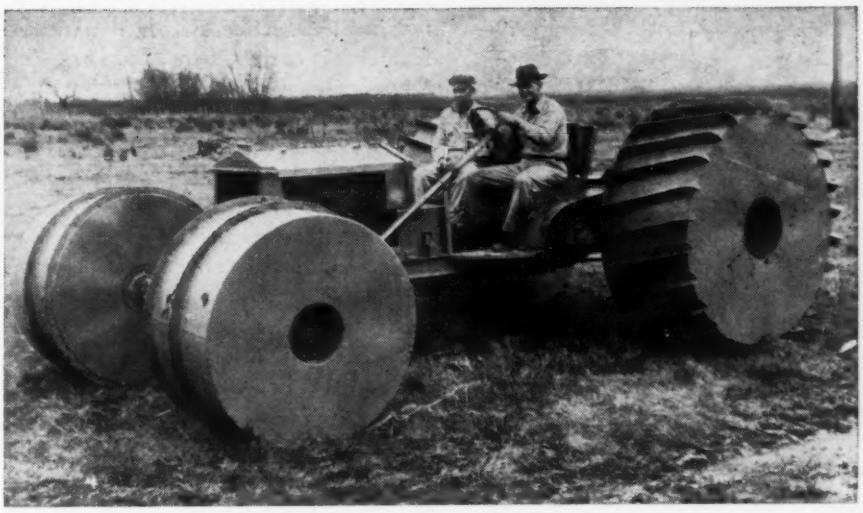
New Marsh Buggy Travels Anywhere

DESIGNED to transport itself along any type of terrain, a new marsh buggy has been built and placed in service by Gulf States Utility Co., Beaumont, Tex. The usual drum wheels are provided with cleats to give more traction for pulling a trailer through marsh land areas which are almost inaccessible during the rainy season. Poles and equipment can be taken to the site of any job.

In addition to being outfitted for deep marshes, the vehicle is also equipped to travel on paved highways. Conventional wheels with rubber tires may be exchanged for the drum wheels, which are then carried on a trailer. Plans have been made for installing a pontoon under the chassis so that it may also be used to cross streams and other small bodies of water.

The power used is a tractor motor, and while not designed for speed it has sufficient power to navigate the deepest mud. This new piece of equipment is expected to be especially useful for line maintenance and construction.



DRUM WHEELS WITH CLEATS to aid traction may be replaced with conventional wheels for road travel on this newly designed marsh-buggy

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A Procedure for Testing Thermal Demand Meters

ACCOMPANYING test procedure for thermal demand meters and for thermal ampere demand meters is based on instructions prepared by American Gas and Electric Service Corp., New York, N. Y.

All thermal demand meters used for measuring watts, either new meters or meters returned from service, should be inspected and tested before installation. Both new and old meters should be given a breakdown test of 1,500 volts, similar to that given watthour meters. The voltage should be applied between coils and between coils and base. A check test should also be made in service on thermal demand meters periodically on the same schedule as the watthour meter with which they work.

All tests should be made with the cover on to prevent inaccuracies due to heat loss. The potential coils of thermal watt demand meters should be energized for about 10 hours before starting the test, at which time the zero point is checked. Polyphase meters should be tested on single phase with their current coils in series and potential coils in parallel.

The laboratory tests may be made either with (1) a standard thermal meter with a fairly steady load, (2) a standard wattmeter with a constant load or (3) a block interval demand meter with a fairly steady load. The test should be made with a single-phase supply at rated voltage and with current and potential connections the same as a corresponding watthour meter. The laboratory test should be made at approximately 50 percent and 100 percent of scale capacity. A standard laboratory test run should be of at least 45-min. duration.

The service check may be made with a standard thermal wattmeter. At least one point on the scale should

be checked; this point should be about the same as the customer's normal demand. The field check may be made at the same time the watthour meter is being tested, that is, the watthour meter may be tested while the check meter and the demand meter under test are running up scale. Before starting the service check, the service meter should be run down scale to a point slightly above zero by reversing the potential connections. A separate current source is necessary when making above test.

Limits of error and minimum time for test runs are given in the table.

	Minimum Test Run	Limit of Error*
Laboratory Tests	45 min.	1% in shop
Service Check	45 min.	2% in service

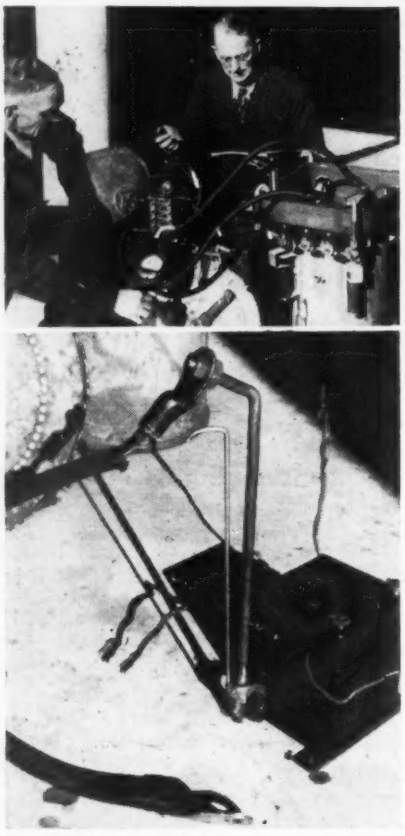
* Limit of error as stipulated by the State Public Utility Commission having jurisdiction, but in no case to exceed the values listed here.

All meters having errors larger than the above limits should be adjusted and a final as-left test made. In general when a check in service shows the meter to be in error it should be removed and taken to the laboratory for adjustment and test.

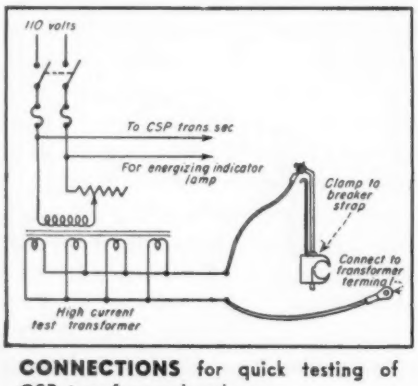
Thermal ampere demand meters likewise should have applied the above testing procedure, test runs and limits of error.

•

Quick Testing of CPS Transformer Breakers



CURRENT IS READ on CSP breaker testing set (top) while trip-out operation is timed with stop watch . . . Special clamp contact connections (below) between breaker and transformer internal tie. Small rod used as handle



CONNECTIONS for quick testing of CSP transformer breakers

WHILE TESTING CSP transformer breakers by the usual method of removing the breakers from the transformers, it occurred to Wm. Lyon of the Montana Power Co., Missoula, that there should be a simpler procedure. Connection was made to the strap leading from the breaker to the transformer winding by a special clamp that could reach down into the oil and contact the strap. This clamp consists of a ½-in. copper rod welded to the bolt head of an Anaconda Copperweld ground clamp. A second smaller rod brazed to the clamp top section serves as a handle. Notches cut into the front lips of the clamp provide a firm grip on the breaker strap and make connecting easier.

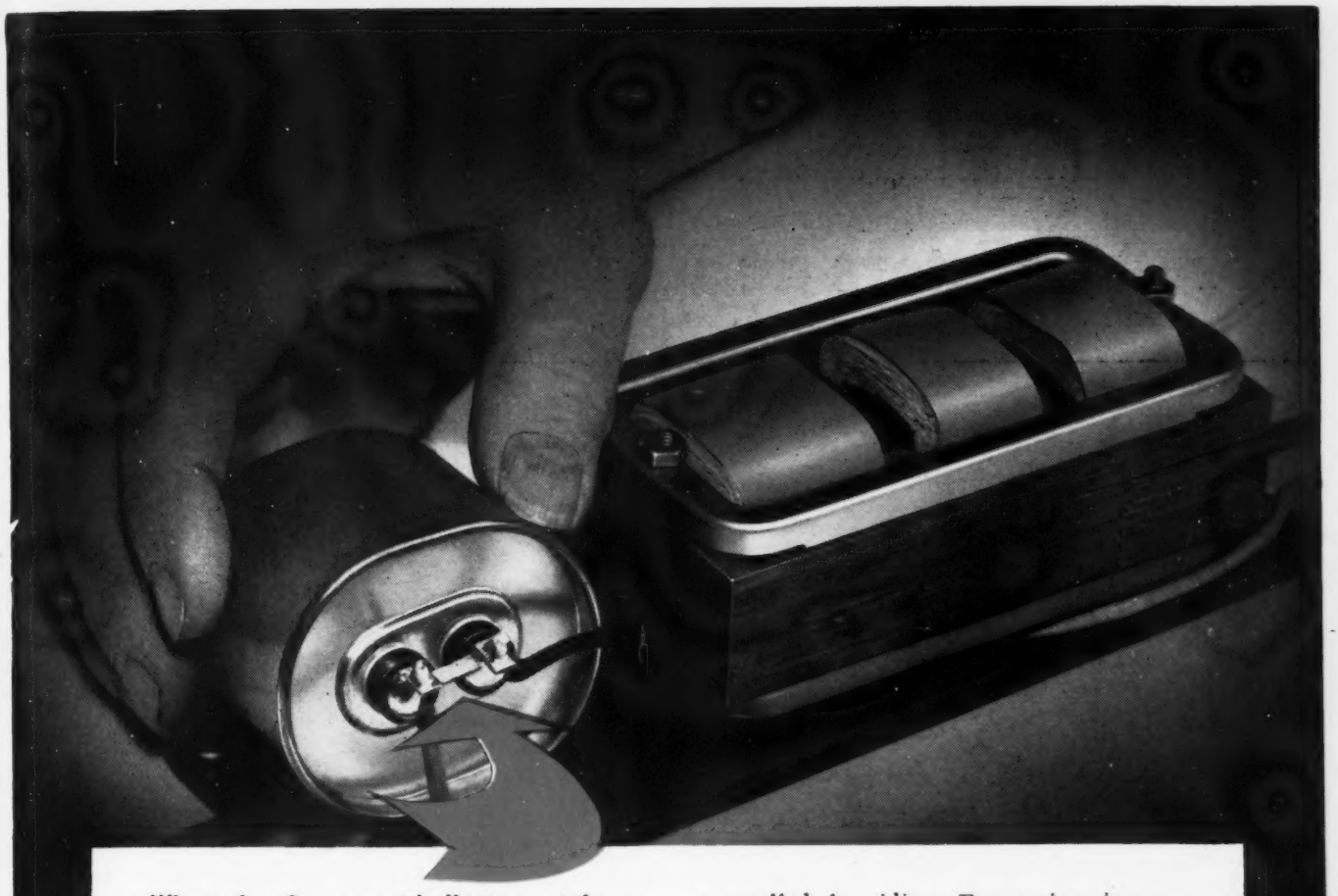
The second problem was a controllable low-voltage high-current supply for tripping the breaker. Although several methods could be used, in this case, a discarded 2,200- to 220-volt potential transformer was rebuilt to supply tripping current. The original 2,200-volt primary was removed and four, 7-volt, 9-turn windings of No. 8 wire were wound in its place. A terminal board with jumper straps permits any connecting arrangement, although the four windings are generally used in parallel. The original 220-volt winding becomes a primary for use on 110 volts. Maximum current from this test transformer is sufficient to test 25-kva. breakers. For controlling current magnitudes a large dimming rheostat is used, although any of the medium variable transformer type of regulators would work nicely. For connecting from the test assembly to the breaker, two four-foot 2/0 extra flexible copper leads are used.

The accompanying diagram shows connections for timing the CSP transformer indicating light as well as the final breaker action. A separate 110-volt source fed into the CSP transformer secondary supplies the trip-out indicator light. A clamp-on ammeter measures current while a thermometer in the oil checks temperature for comparison with curves or tables supplied by manufacturers. A stop watch is convenient for timing breaker operating time.

•

Conduit Case For Switch Stick

CONDUIT PROTECTS switch stick. An idea for protecting the 18-ft. switch stick used for operating tower-mounted 230-kv. dead-line disconnects, is this piece of conduit, with cap on one end and hinged cover on the other. When strapped to the platform railing this will provide a convenient, always available, moisture-proof container for a switch stick used only occasionally by a line patrolman



What other fluorescent ballasts meet these tests? Typical of the care that goes into the making of General Electric fluorescent lamp ballasts is the testing program which all materials—every part, must pass.

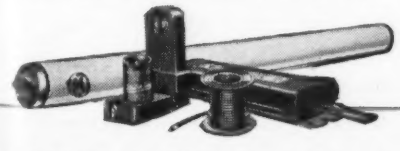
G-E Pyranol capacitors, which provide power-factor correction for the ballast, are a good example. Every material used in these capacitors—from the kraft paper to the non-flammable Pyranol liquid dielectric—is carefully tested. Winding is performed in an air conditioned room, under controlled humidity. Evacuation is precision controlled. Then, *every single capacitor* is subjected to tests for electrical characteristics, electrical faults, and possible leaks.

The care taken in selecting fine components for every G-E ballast is supplemented by six different checks for correct operating characteristics, in addition to continual quality tests on complete ballasts. Finally, each ballast is subject to selection for independent testing by Electrical Testing Laboratories, Inc.

the ballast you can

Install and forget

BALLASTS LAMPS STARTERS
CABLE LAMPHOLDERS
for
DEPENDABILITY in fluorescent lighting



General Electric makes ballasts so you can install them and forget them. Their quietness, their ability to assure rated lamp life and light output, and their recognized reliability become your silent salesmen—to help keep your fixtures sold. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

412-8

How to Maintain Temperature Indicators For Generators and Large Transformers

I*—TYPES OF D. C. TEMPERATURE INDICATORS

W. F. DUNKLE
Supervisor of Electric Tests
Pennsylvania Power & Light Co.
Hazleton, Pa.

INSTRUCTIONS are outlined for checking and adjusting four types of instruments and thereby provide for accuracy when apparatus temperatures are being measured.

1. Operation. The principle upon which the direct-current temperature instruments operate may be stated briefly as follows:

(a) *Differential Coil Instruments* are actuated by a change in resistance of a 10-ohm embedded coil which in turn unbalances the current through the two coils of the meter, thus giving a torque proportional to the insulation temperature in the region of the coil in degrees Centrigrade.

(b) *Bridge Instruments.* A galvanometer actuated by a change in resistance of an embedded coil so as to give the true resistance of the embedded exploring coil in the insulation in terms of degrees Centrigrade.

(c) *Kelvin Bridge.* The same principle as the Wheatstone Bridge except the galvanometer is balanced to zero and the balancing resistance dial is graduated to indicate degrees temperature rather than ohms field resistance.

(d) *Thermocouple.* The electromotive force or millivolts generated by the thermocouple is a function of the temperature. The indicator is a millivoltmeter graduated in degrees Centigrade.

2. Designations By Manufacturers.

(a) Differential Coil Type: General Electric Co., Styles DRY, DR2Y, D7Y, D8Y, DH3Y, DH5Y.

(b) Bridge Type: Westinghouse Electric Corp. Styles SX, HX, KX, DX.

(c) Kelvin Bridge Type: Leeds & Northrup Co.

(d) Thermocouple Type: Westinghouse Electric Corp. Styles SX, HX, KX, DX.

3. Operating Voltage.

(a) Differential Coil Type: Storage battery 125 volts; rectified 125 volts.

(b) Bridge Type: Storage battery 20-125 volts; rectified 20-125 volts.

(c) Kelvin Bridge Type: Normal field voltage of field whose temperature is to be observed.

(d) Thermocouple Type: Storage battery 20-125 volts.

4. Accuracy. Temperature instruments are designed for greatest accuracy at the danger temperatures of 80 deg. C. and above. An embedded exploring coil is, by A.I.E.E. standards, 10 percent cooler than "hottest spot" temperature. Above 80 deg. C. good instruments should and will indicate within 3 deg. of the actual average temperature of the exploring coil if they and their associated accessory equipment are properly maintained. At the balanced resistance point of any instrument, the over-all accuracy should be a maximum and should not be affected by changes in the value of operating voltage.

5. Precautions. The wire size, connections and resistance values of the various branches of the circuit with which the standard 10-ohm coil is compared, are of extreme importance in obtaining correct temperature indications. Connections should be soldered, wherever possible. All transfer switch contacts should be maintained with less than 0.03-ohm contact resistance which is the equivalent 1 deg. C. error in indication. The three wires to each 10-ohm temperature exploring coil must be of the same size and be within the same cable and conduit. Test lead resistance must always be subtracted when testing low values of resistance.

6. Testing Procedure; 10-Ohm Coils. At installation and on the occasion of each annual overhaul of the machine or equipment, whenever temperature indicator trouble is evident, the following shall be the method of locating the trouble.

(a) Isolate the temperature measuring circuit from the battery and measure accurately with a Wheatstone Bridge the resistance of the detector coil from (*a*) jack at switchboard, (*b*) cable termination at base of switchboard and (*c*) coil lead termination at the generator or transformer, whichever the case may be. The temperature of the winding in which the 10-ohm coil is embedded shall be observed with not less than two thermometers in contact with the equipment. At least 0.5 hr. should elapse after placing the thermometers before measuring resistance. Putty assists in obtaining the correct temperature.

(b) Resistances are of no value unless they are accurate along with the temperature at which they were observed.

(c) Deduct lead resistance from total resistance to get coil resistance.

The temperature will then be $T = (25.95R_c - 234.5)$ degrees C. and R_c = Resistance of coil accurately determined.

7. Wiring Check: d.c. instruments; 10-ohm coils. At installation and when the necessity arises, make a working diagram of the wiring and keep it for future reference.

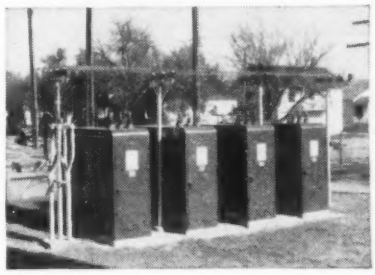
* Beginning a series of six articles; an adaptation from a paper presented at a Doble Clients Conference. Author acknowledges assistance in preparation of this information, given by H. R. Steward, Pennsylvania Power & Light Co., and J. S. De Shazo, now employed by Georgia Power & Light Co.

KILOVAR ECONOMICS #5

Johnny says:

"If your peak load is at 80 per cent power factor, you can often increase your system capacity—from generator to distribution transformer—almost 20 per cent by installing capacitors near loads. You can do it in a matter of weeks—which helps answer today's big need. You will lower ***your total investment per kilowatt of capacity—which will help answer tomorrow's problem."***

Unless your territory is different, you are facing a load growth which now, or in the next two to five years, will require additional capacity.



Where this is true, it is timely to review your load, present and anticipated, in terms of demand for kilowatts, and *separately*, demand for *kilovars*. Kilowatts can be supplied only by your central stations. Kilowatt capacity, however, can often be made available by supplying your *kilovar* demand at or near loads—freeing distribution, transformer, transmission, and generating facilities for the delivery of more payload.

Capacitors are available on quick delivery. Their installed cost is about $10 per kvar. A comparison with either delivery or price of new kilowatt generating, transmission, and distribution equipment will show why additional capacitors for *kilovar* generation should be your first step in increasing capacity.

Nor should you wait until you *need* capacity; for capacitors can pay their way now by substantially reducing copper losses.

A General Electric representative will be glad to work with you in determining what proportion of your new capacity can be economically provided by capacitors. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

AMONG COMPANIES THAT HAVE INCREASED CAPACITY WITH CAPACITORS . . .

Typical of the companies now taking advantage of on-the-spot kilovar generation are Oklahoma Gas and Electric Company, with capacitors up to 20 per cent of the peak load; Central Maine Power Company —23%; Public Service Electric and Gas Company—22%; Illinois Power Company —18%.

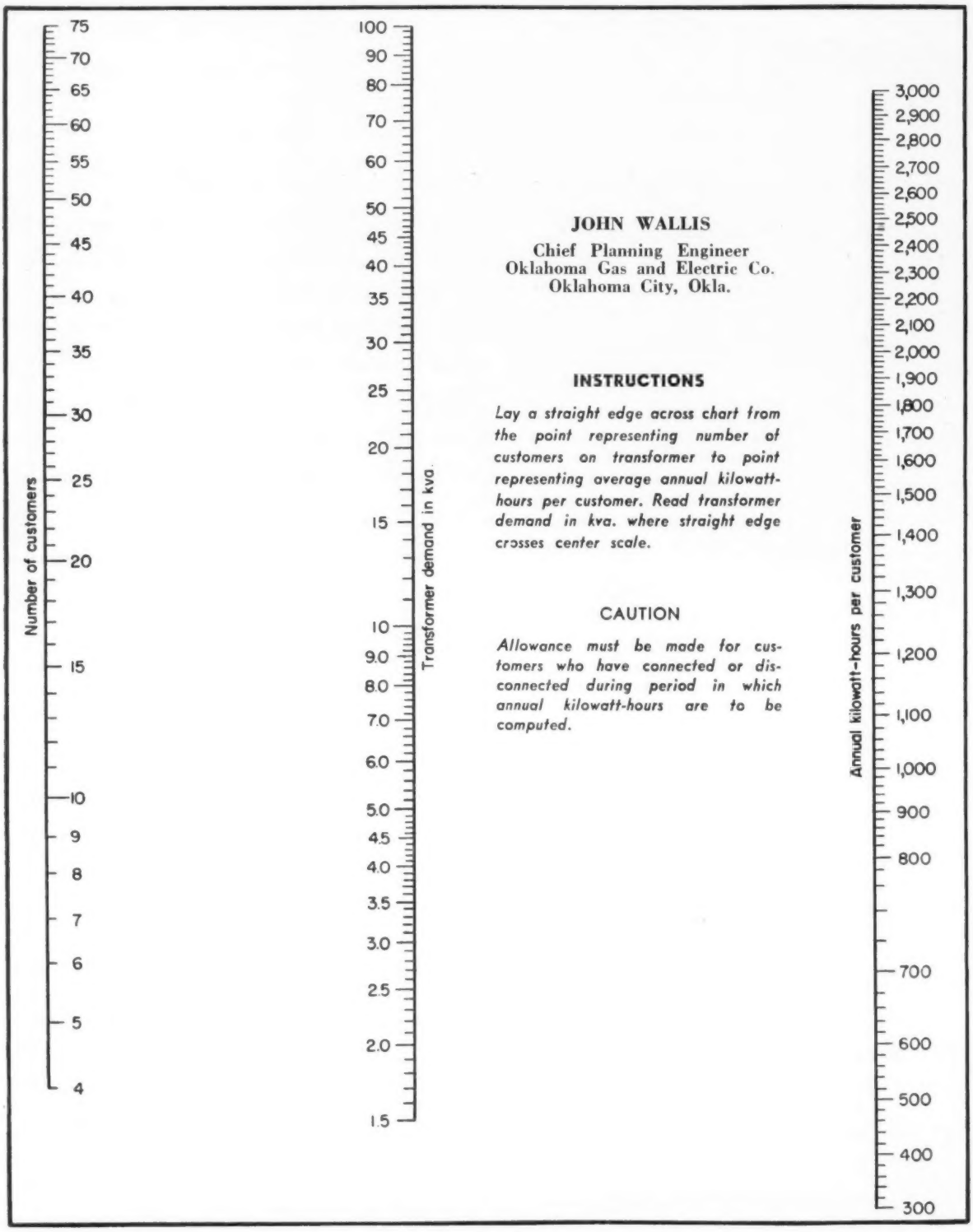
APPLICATION OF CAPACITORS IS FLEXIBLE

Capacitors can be installed either on primary or secondary feeders, as a unit for a locality, or at a specific load center—such as a substation. They can be installed in large units with automatic switching, or as smaller units on distribution circuits for voltage improvement. Their cost is low. Installation does not disrupt operation. They are 100 per cent salvageable in case of changing requirements.

GENERAL ELECTRIC

407-121

Chart Gives Transformer Demands In Residential Areas



Nomogram has annual consumption scale for 3,000 kw.-hr. per customer; an extension from 2,000 kw.-hr. as used originally in the article entitled "Determine Transformer Load From Customer Records" by Perry Shelley and the author, published in ELECTRICAL WORLD, December 31, 1941, page 74

SILICONE -TREATED

to beat the heat up to 200 C

From the heat-resistant properties of General Electric silicone varnishes, a complete new line of Deltabeston* cables now gets extra heat protection in every layer of insulation. With such thorough silicone treatment, these cables are ready to help you beat heat problems in 600-volt service at temperatures up to 200 C (392 F).

A SILICONE-TREATED felted-asbestos layer gives protection against ambient heats. Another SILICONE-TREATED asbestos layer fights conductor heat. Between the two, a SILICONE-TREATED glass tape adds moisture resistance and dielectric strength. Then, an over-all abrasion-resistant glass braid is SILICONE-TREATED for extra toughness.

Also available now are silicone-treated Deltabeston cables for 300-volt service. Both 300- and 600-volt constructions are approved for use in the wiring of ovens or other high-temperature equipment, such as furnaces and control apparatus, where the acceptability of the wire for the particular use has been determined by the Underwriters' Laboratories, Inc.

For information, write to Section Y79-727, Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Connecticut.

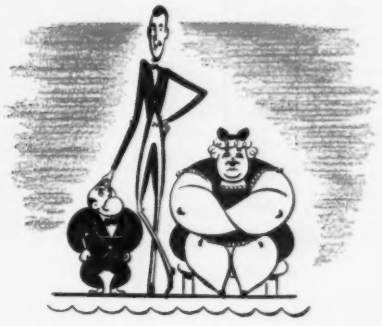
*Trade-mark Reg. U. S. Pat. Off.

DELTABESTON
wires and cables
built to beat the heat

GENERAL ELECTRIC

HI-AMBIENTS!

application hints from your Deltabeston Distributor

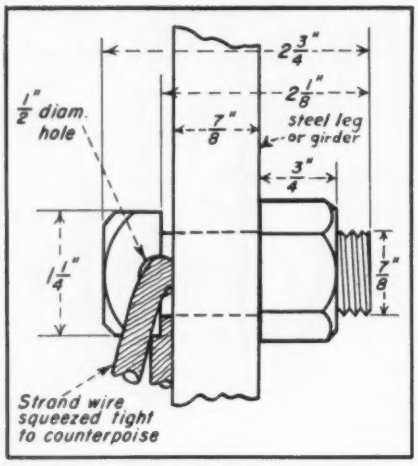


ALL SHAPES AND SIZES of glass and asbestos magnet wire are available in extra heat-beating form. Whether you do your own winding or have it done by an outside shop, make sure that all your winding jobs are done with Deltabeston.

MOISTURE RESISTANCE is only one of the long list of advantages Deltabeston power cable offers you. Like all Deltabeston products, it's a heat beater that can't be beat, because it's insulated with purified asbestos. Varnished cambric and heavy braid or lead sheath help resist abrasion, flame, grease, corrosive vapors, and oil.

FOR INFORMATION on any part of the heat-beating Deltabeston line, get in touch with your General Electric merchandise distributor. He's got a solution for your heat problem, and he'll be glad to tell you about it.

Attachment for Ground Wire to Tower Leg



GROUND CONNECTION arrangement. Hole is drilled partly in head, partly in shank of bolt to give more bearing and better seat for ground wire or rod against steel leg and to lessen the cutting effect on being squeezed

DAVID B. CLAPP
Engineering Assistant
Public Service Electric and Gas Co.
Newark, N. J.

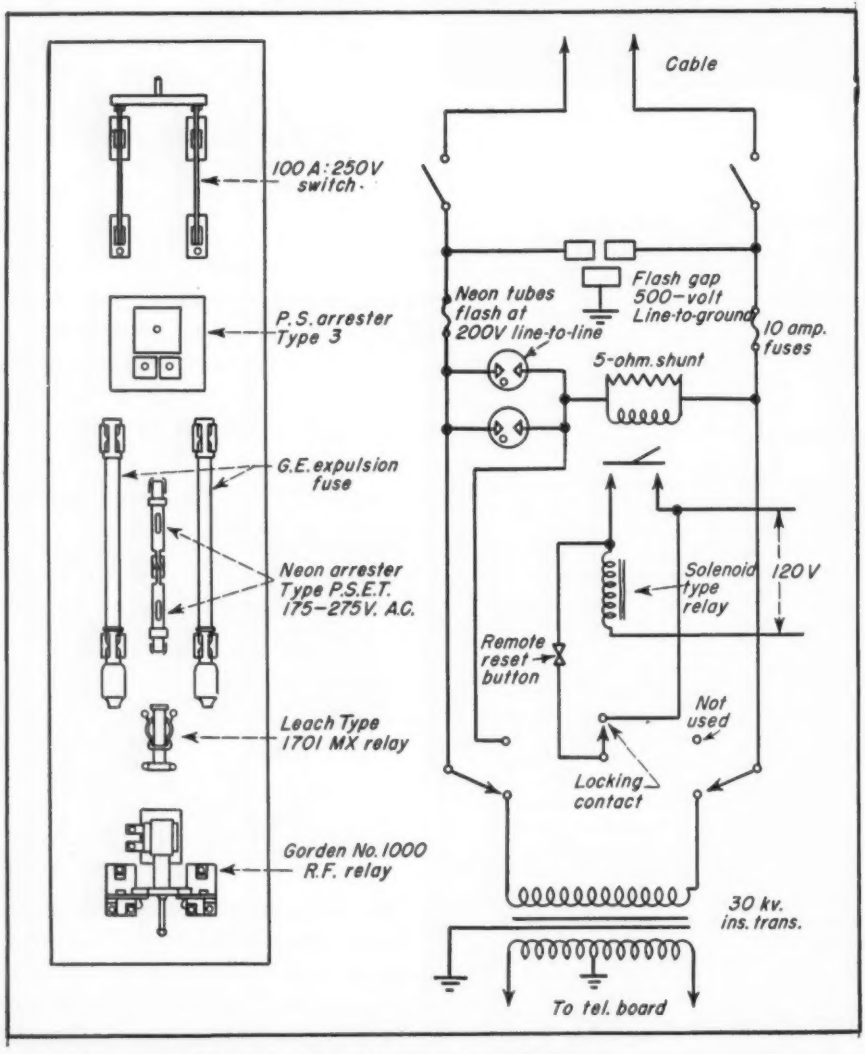
ADAPTATION OF a standard bolt suitably drilled for insertion of a ground wire has simplified the making of ground connections to steel tower legs and has saved time and labor. This solution was developed by Joshua D. Reed of Public Service Electric & Gas Co. when confronted with the job of putting ground wires on steel towers, and in turn connecting the ground wire to an underground counterpoise paralleling the tower line.

This form of connection has been used for more than three years and has been used on girders and ground rods. Size of bolt is governed by the size of hole to be drilled through it and size of ground wire to be used.

Bolts are prepared in the machine shop where a jig is available. To hold the bare strand ground wire a hole is drilled partly in the head and partly in the shank of the bolt. Accompanying sketch illustrates the drilling arrangement for ½-in. diameter hole and dimensions for standard bolt used. Before the bolt is inserted in the tower leg, steel surface of the member is filed for a clean connection with the ground wire. A tight connection of the wire and steel is made by the draw on the bolt and nut. "No Oxid" grease is applied over the entire connection to protect it from the weather.

• • •

Remote Hi-Line Telephone Protection



TELEPHONE PROTECTION PANEL layout and circuit diagram

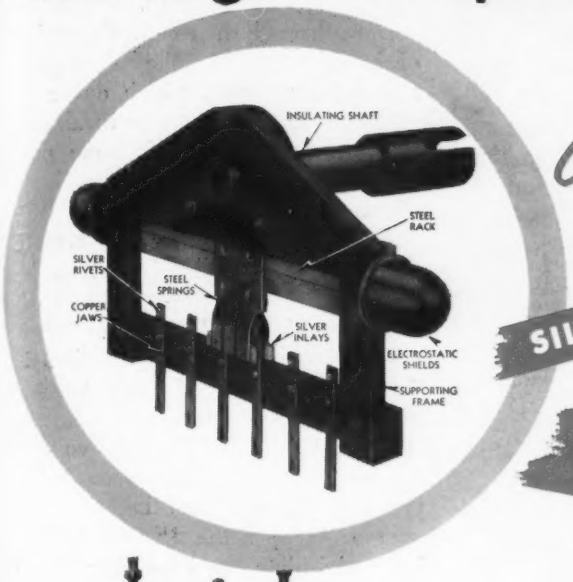
G. G. MENDENHAL
Communication Engineer
Puget Sound Power & Light Co.
Seattle, Wash.

WHEN space limitations in the central dispatching office of Puget Sound Power & Light Co. required moving of the company telephone protective equipment to the basement of the building, it was necessary to devise a scheme for resetting the protection by remote control. The board illustrated and the scheme described was the result.

The board contains nine panels, one for each of the incoming hi-line telephone circuits. Each panel contains the following equipment, starting at the top of the board and progressing down: an ordinary 100-amp., 250-volt knife switch; a ground gap; two high-voltage, 10-amp. expulsion fuses; two neon tubes; a Leach type 1701 MX relay, and a Gorden No. 1000 RF relay. Circuit diagram is as shown.

The three-point gap is spaced 0.010 in. to flash over at approximately 500 volts line-to-ground. It will handle 50 amp. or more for short periods. The three metal blocks are mounted on a Mycalex block which dissipates heat rapidly and will withstand flashover without

Only in a PENNSYLVANIA TRANSFORMER do you get the Straight Line Tap Changer with Silver Alloy Contacts



All you want in a Tap Changer and More!

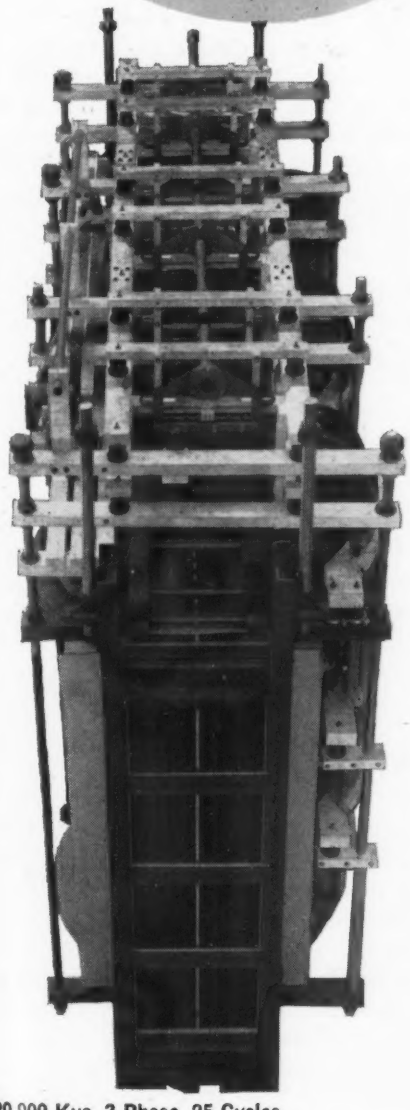
SILVER ALLOY CONTACTS

SELF-ALIGNING CONTACTS

SIMPLE IN DESIGN

RELIABLE IN CONSTRUCTION

WILL NOT FREEZE IN POSITION



20,000 Kva, 3 Phase, 25 Cycles, OISC, 44000-6600 volts.

Arrangement of tap changers on 3 phase transformer. Note that all 6 tap changers are operated by a single shaft.

Gives Pennsylvania Power Transformers Unsurpassed Reliability . .

★ *NO HOT SPOTS*
Silver alloy contacts are capable of carrying heavy overloads and withstanding short circuits without overheating because of low initial contact resistance.

★ *DURABLE*
Hardness of silver contacts prevents harmful wear, even under continuous operation such as in a motor-operated tap changer. Contacts are installed with a minimum of flat surface at the contact points to prevent the accumulation of sludge. Silver alloy contacts will never freeze in position.

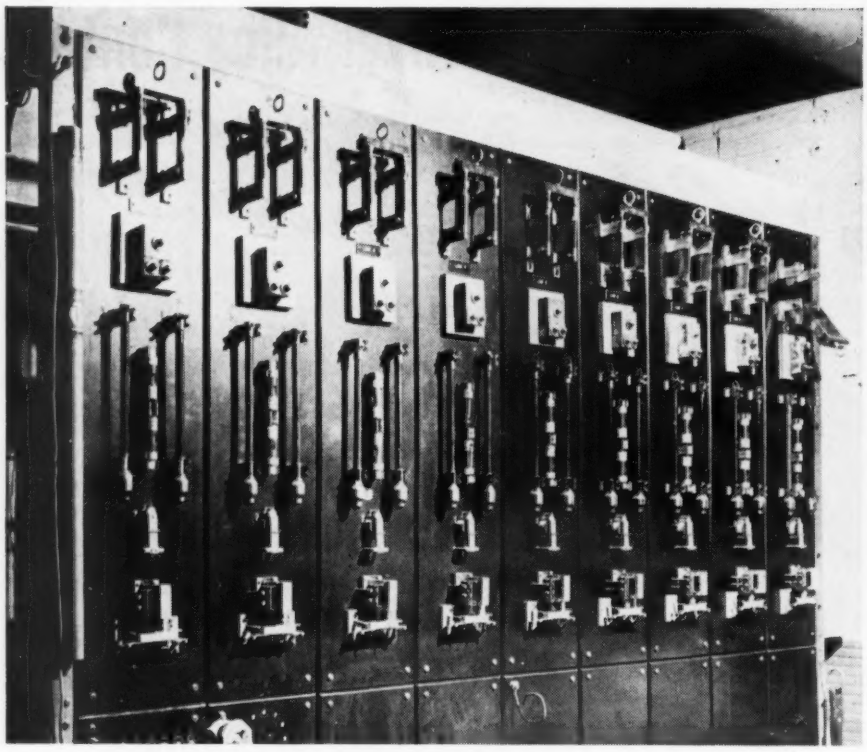
★ *EASY TO OPERATE*
The direct connection of the shaft to the gear and use of a minimum number of bearings, plus the application of low friction, silver alloy contacts, result in a very low torque and an easy to operate tap changer.

★ *SELF-ALIGNING*
Pennsylvania Tap Changers possess a self-aligning feature which assures a high pressure contact at all times. This is accomplished by the special steel spring construction and straight-line motion of the movable jaw.

★ *CORONA ELIMINATED*
In higher voltage tap changers the elimination of corona is very important. This is accomplished in Pennsylvania Tap Changers by electro-static shields of spun copper connected to the live parts of the tap changer. Discharges due to corona are thus prevented.

Pennsylvania TRANSFORMERS

Pennsylvania
TRANSFORMER COMPANY
808 RIDGE AVENUE, PITTSBURGH 12, PENNSYLVANIA



REMOTE TELEPHONE PROTECTION BOARD. Neon tubes may be seen between the long expulsion fuses in center of each panel. Dispatcher can remotely reset relays to test lines after trouble has occurred

damage. The arrester tubes are neon-argon, no-limiter tubes with firing point of 200 volts. In event of high voltage between the two line wires these tubes pass heavy current and the MX relay functions. A shunt (shown) is placed across the relay coil to prevent the relay from pulling in on less than 1 amp. line-to-line current through the tubes. Operation of this relay energizes the RF solenoid type latching relay, which opens its main contacts to isolate the insulating transformer and the telephone pair leading from it to the dispatcher's office.

The dispatcher has a remote master release button by which he can close the relay for testing to see if the trouble has cleared.

Functioning of the protection is then briefly this: If high voltage appears from line-to-ground, the arrester spills over; if high voltage appears line-to-line, the neon tubes pass heavy current and the MX relay operates to open the RF solenoid relay and isolate the insulating transformer and circuit and equipment beyond from damage. The dispatcher may then press his reset button to test the incoming cable pair.

The telephone circuits reach the office building via underground, 2,300-volt cable with impact rating of 10,000 volts. Protection at the overhead end of the cable consists simply of a three-point arrester gap.

• • •

Watt and Var Solution of Voltage Problems . . . II*

E. C. GOODALE
Bonneville Power Administration
Portland, Ore.

Use of watts and vars instead of volts, amperes, and power factor can greatly simplify calculations in transformer regulation problems. In the course of delivering energy over a transmission line or through a transformer bank it is found that the voltage received varies from that at the sending end in two ways. It is out of phase and it is different in amount. The greater the load the greater these differences. They are usually expressed in terms of the angle "ϕ" of phase shift between input and output voltage and the "regulation correction factor," (*RCF*). In a transformer this is known as the "ratio correction factor."

The output voltage of a line is equal to (input voltage)/(*RCF*). In a transformer the output or secondary voltage is equal to (input or primary voltage)/(nameplate voltage ratio times *RCF*).

Lines

Rather than the conventional method of making calculations, the simplest and most direct means of determining ϕ and *RCF* for a line is by using the value of watts (W) and vars (V) of the load and the resistance ohms (R) and inductive reactance ohms (X) of the line itself. An estimated value of output voltage (E_2) is assumed. In this case ϕ is determined in terms of its tangent and,

$$\text{Tan } \phi \text{ equals } \frac{VR - WX}{E^2_2 + VX + WR} \qquad (1)$$

$$RCF \text{ equals } \frac{1}{\cos\phi} + \frac{VX + WR}{E^2_2 \cos\phi} \qquad (2)$$

If tan ϕ is less than 0.044, the angle ϕ is less than $2\frac{1}{2}$ deg., its cosine is between 0.999 and 1.000 and it may be disregarded in equation (2) with an error of less than 0.1 percent in *RCF*, which then becomes

$$RCF \text{ equals } 1 + \frac{VX + WR}{E^2_2}$$

In the above cases W and V may be expressed as watts and vars and E_2 as volts or, more simply, W and V may be expressed as megawatts and megavars and E_2 as kilovolts. The expressions are for use either in terms of equivalent one-conductor single-phase watts and vars and line-to-neutral volts or as balanced three-phase watts and vars and line-to-line volts. In either case R and X are for a single conductor. For two-conductor single-phase circuits R and X are twice the value for a single conductor and E_2 is line-to-line voltage. W and V are single-phase watts and vars. In all cases above it is assumed that all

* Continuing a three-article series which began in Electrical World, July 5, 1947, page 108, on the use of watts and vars to simplify power system problems.

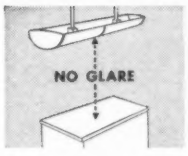
6 reasons why

the new Wakefield STAR helps you

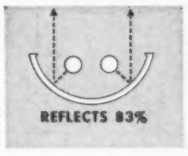
"Hang the Sky"

FOR Over-ALL Lighting

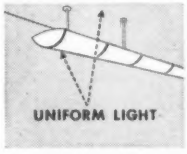
Design Pat. Pend.



1. Low brightness . . . a maximum of .3 candles per square inch according to ETL test. Means no glare or reflected glare.

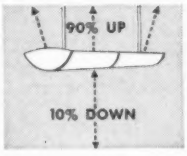


4. High efficiency reflecting surface, of Plaskon . . . light weight, non-shattering, non-electrostatic, and reflects 83%.

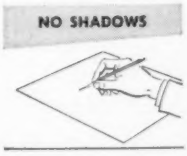


2. Blends into ceiling . . . means no distracting dark or bright patterns overhead . . . greater eye comfort.

5. Easy to maintain . . . reflectors slide out like a drawer for quick, easy cleaning, maintenance of original light output.



3. Provides soft pleasing indirect light . . . with light distribution 90% UP and 10% DOWN.



6. No shadows on work . . . because "ceiling of light" means large area source with light over all . . . and thus . . . Over-ALL Lighting!

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LIGHTING EQUIPMENT FOR OFFICE, SCHOOL AND DRAFTING ROOM

Over-ALL—
in lighting,
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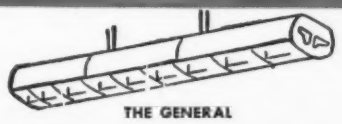
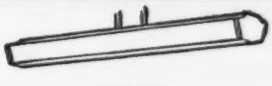
For full details write for Catalog No. 46. The F. W. Wakefield Brass Co., Vermilion, Ohio.



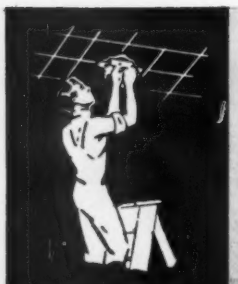
THE GENERAL

THE GRENADIER

THE COMMODORE



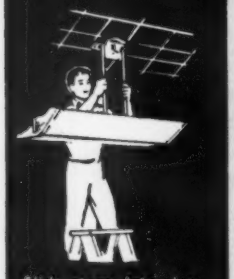
THE DIPLOMAT



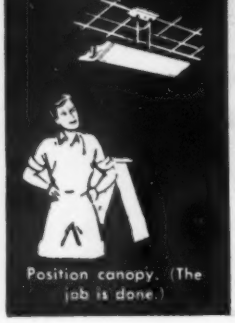
Attach hanger strap to outlet box.

Screw stems into channel.

Slip canopy over stems.



Slide stems into slots of hanger straps.



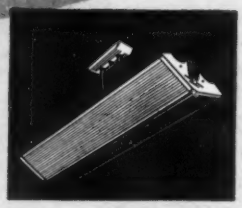
Position canopy. (The job is done.)

NEWEST SILV-A-KING FLUORESCENT FIXTURE

THE *Vanguard*

for commercial installations

CAN BE SUSPENDED AS ILLUSTRATED



A quarter-century of quality engineering stands behind the new SILV-A-KING "Vanguard." Install it in offices, stores, showrooms, hospitals, and schools — to satisfy the most exacting demands!

"VANGUARD" QUALITY FEATURES:

LOUVRE Egg-crate louvre shields lamps, provides maximum diffusion.

SIDE PANELS Steel frames eliminate danger of sharp edges, add strength. Securely top-hinged to facilitate maintenance.

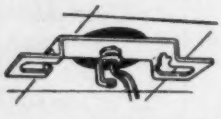
GLASS Frosted ribbed glass panels intensify light diffusion, remove glare.

SLOTTED END PIECES Engineered to provide soft light glow. Eliminates dark ends.

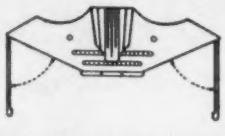
CANOPY AND STEMS (Optional) Precision fitted. Matte aluminum finish.

STANDARDS I.B.E.W., A.F. of L.; approved and listed by Underwriters Laboratories, Inc.

FINISH All metal surfaces in high-temperature, baked white enamel of high reflectivity, lasting quality.



New-Type Hanger Strap, for easy suspension installation ...a one man job!



Hinged mechanism allows side panels to open and plumb themselves, for easy access.

Write for new "Vanguard" Bulletin!

BRIGHT LIGHT REFLECTOR COMPANY, INC.

Subsidiary of Bridgeport Pressed Steel Corp.
Fairfield at State, Bridgeport 5, Conn.

SILV-A-KING LIGHTING EQUIPMENT
SINCE 1921

conductors are equal. (If V is not known it may be found equal to $W \tan\theta$ where $\cos\theta$ = power factor.)

Example: Assume a balanced three-phase load of 3,000 kilowatts and 1,500 kilovars supplied over a line having single-conductor values of 5 ohms resistance and 7 ohms inductive reactance. An output voltage of approximately 11,000 is expected.

$$\text{Tan}\phi \text{ equals } \frac{1.5 \times 5 - 3 \times 7}{11^2 + 1.5 \times 7 + 3 \times 5}$$

$$\text{equals } \frac{7.5 - 21}{11^2 + 10.5 + 15}$$

$$\text{Tan}\phi \text{ equals } \frac{-13.5}{121 + 25.5} \text{ equals } \frac{-13.5}{146.5}$$

$$\text{equals } -0.0924$$

Angle ϕ equals -5 deg. 17 min. (negative sign means output lags input voltage)

$\text{Cos}\phi$ equals 0.9958

$$RCF \text{ equals } \frac{1}{0.9958} + \frac{25.5}{121 \times 0.9958}$$

$$\text{equals } 1.0042 + 0.209 \text{ equals } 1.213$$

The input voltage required to give 11,000 volts output is therefore 11,000x1.213 equals 13,343 volts.

If the input voltage is known but not the output, then an output voltage, estimated as closely as possible, must be assumed as above and ϕ and RCF determined on this basis. In this case (input voltage)/(RCF) should equal output voltage. If it does not equal the assumed value, then the problem should be worked through again, using this calculated value for the output voltage. Usually the results will be close enough when worked through the second time.

To compensate approximately for the boosting effect of line capacitance, one-half the vars generated on the line may be subtracted from the var load in using equations (1) and (2).

Transformers

In the case of a transformer, although equations (1) and (2) may be used to determine ϕ and RCF, it is usually more simple and direct to use the following equations:

$$\text{Tan}\phi = \frac{V\,(\%R) - W\,(\%X)}{100M + V\,(\%X) + W\,(\%R)} \quad (3)$$

$$RCF = \frac{1}{\cos\phi} + \frac{V\,(\%X) + W\,(\%R)}{100M\cos\phi} \quad (4)$$

If $\tan\phi$ is less than 0.004,

$$RCF = 1 + \frac{V\,(\%X) + W\,(\%R)}{100M}$$

In the above expressions, "$\%R$" and "$\%X$" represent the percent resistance and inductive reactance of the

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of Binghamton

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CANVAS DUCK BAG

A zipper-closing, heavy-duty, drab canvas-duck bag, reinforced at the bottom and sides. All seams strongly stitched throughout. Plenty of room for tools plus extras such as work clothes. In three sizes — 20", 22", 24" long, x 10½" wide x 12" high.

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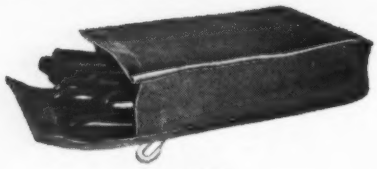

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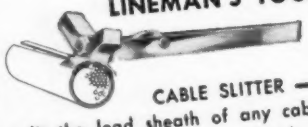

CABLE SLITTER — will slit the lead sheath of any cable in general use. Adjustable blade, dog for spreading; adaptable to right and left hand use. Safe, simple, easy to use.

No. 650
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One large, two small and two deep wing pockets for various tools. Knife snap optional. Of finest leather, heavily stitched and riveted.

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transformer in question and "*M*" represents its volt-ampere rating. *V*, *W*, and *M* may be expressed in terms of watts, vars, and volt-ampere rating; kilowatts, kilovars, and kilovolt-amperes rating or megawatts, megavars, and megavolt-amperes rating, as desired. Either a single-phase or a three-phase basis, throughout, may be used.

If only the impedance rating, %Z, is known for the transformer, the %*R* may be assumed equal to ⅓ percent and the % *X* equal to

$$\sqrt{\%\,Z^2 - 0.1}$$

which approximately equals %Z. (*V*, if not known, = W tanΘ, where cosΘ = P.F.)

Example: Assume a bank of three 6,000-kva. transformers of impedance rating %Z equals 8 percent, carrying a load of 10,000 kilowatts and 4,000 kilovars. %*R* is assumed ⅓ percent. %*X* is assumed 8 percent.

Tanϕ equals

$$\frac{4 \times (1/3) - 10 \times 8}{100 \times 18 + 4 \times 8 + 10 \times (1/3)}$$

$$\text{equals} \frac{(4/3) - 80}{1800 + 32 + 10/3}$$

$$\text{Tan}\phi \text{ equals} \frac{-78\ 2/3}{1800 + 35\ 1/3}$$

$$\text{equals} \frac{78\ 2/3}{1835\ 1/3} \text{ equals } -0.0429$$

Angleϕ equals − 2 deg. 27 min. (negative sign means secondary voltage lags primary)

Cosϕ equals 0.9991

$$RCF \text{ equals} \frac{1}{0.9991} + \frac{35\ 1/3}{1800 \times 0.9991}$$

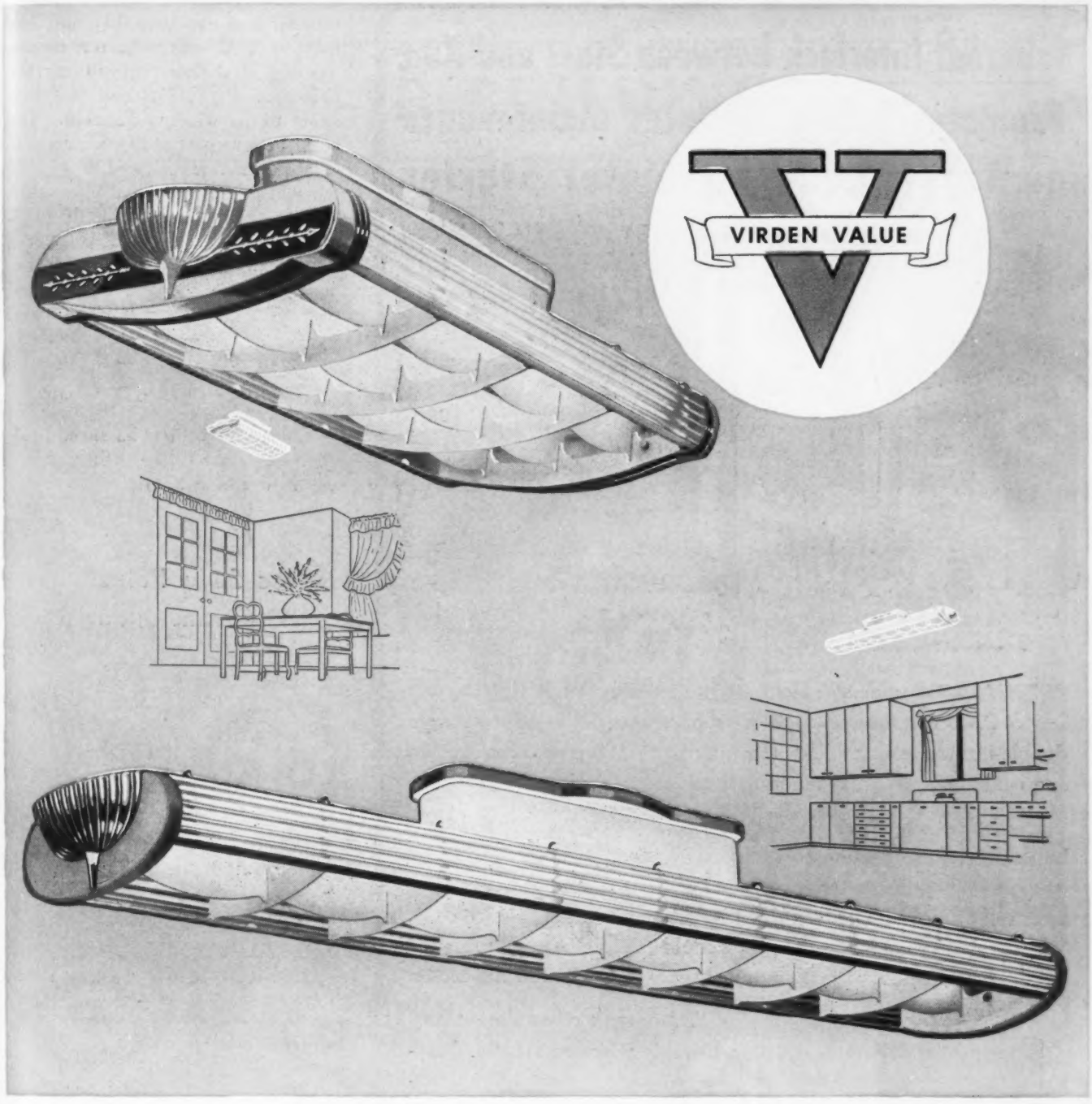
equals 1.0009 + 0.0196 equals 1.0205

If the actual secondary voltage is known, say 68,000 volts, and the nameplate taps in use are 115,500 to 67,500 volts, the actual primary volts would be

$$68{,}000 \times \frac{115{,}500}{67{,}500} \times 1.02 = 118{,}700 \text{ volts}$$

To compensate approximately for the effect of the transformer exciting current, one-half the watts and vars represented by this exciting current may be added to the watt and var load of the transformers in using equations (3) and (4). The exciting current watts are the no-load core loss watts and the exciting current vars are the no-load core loss vars, usually only slightly less than the product of primary volts times primary amperes with secondary winding open-circuited.

For application to three-winding



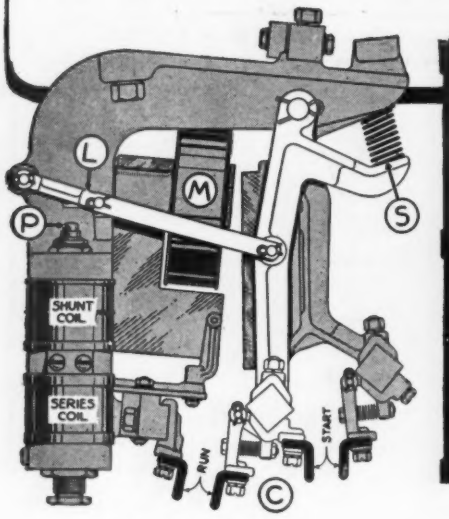
are in stock at our wholesalers

RESIDENTIAL—At the top a new 4, 20-watt lamp fixture that will be widely used in residential lighting programs for both kitchen and dining room lighting. A ceiling fixture of the first rank. Utilizes plastics for both decorative and lighting effect. No need to tell you it's rich in beauty and will go over big. It's right in price, performance and personality. • Below is our 2, 40-watt lamp unit for the kitchen. Your customers will like it.

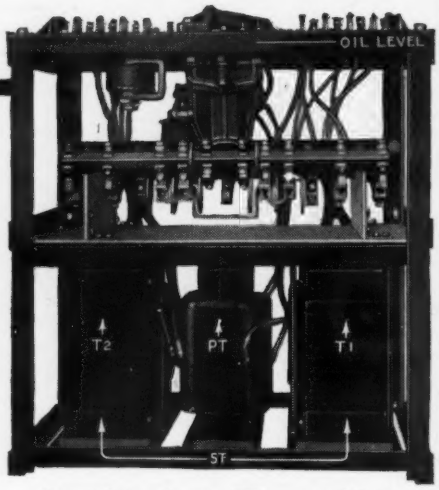
The Virden "kit" idea has made an enormous hit. Ask your Virden wholesaler.

Cleveland, Ohio • *Member American Home Lighting Institute*

Inherent Interlock between Start and Run Promotes Safety, Reduces Maintenance on This 2300-Volt Motor Starter



Side view of Contactor.



Potential transformer (PT) mounted between auto-transformers (T1 & T2) supplies low voltage for the Push Button circuit.

THIS EC&M automatic Motor Starter for reduced voltage starting of 2300 volt squirrel-cage or synchronous motors uses a simple double-throw contactor (C). The interlock (L), between the starting and running contacts, is inherent in the basic design.

The single operating magnet (M), when energized by the push button, closes the starting contacts, connecting the motor to reduced voltage. When the motor accelerates to the proper speed, a current limit relay raises plunger (P) to trip the mechanical interlock (L). The running contacts then close, connecting the motor across the line. During transition, continuous torque is applied to the motor.

There is no other starter built like this EC&M automatic. Magnetic overload relays of the non-creeping, drop-back type are enclosed above the conduit connection box. Door permitting access to them is arranged for padlock. Meters are optional. Investigate these 2300 volt starters. Bulletin 1047-C, describing them, will be sent promptly on request.

BULLETIN 1047-C STARTER IN STANDARD TYPE II (drip-tight) ENCLOSURE.

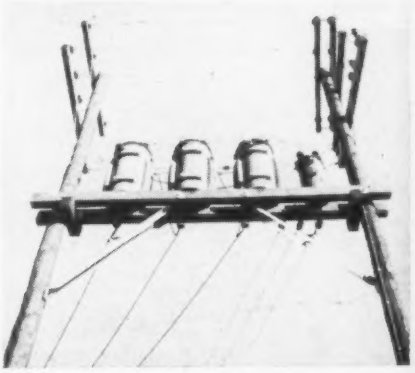
THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79th STREET • CLEVELAND 4, OHIO

transformers equations (3) and (4) may be used with reference to one winding at a time, substituting the values of W, V, $\%R$ and $\%X$ that apply to the winding question. The effect with respect to two windings is cumulative. The phase shift angle is the sum of the individual phase shift angles. The *RCF* is equal to the product of the individual *RCF's*. For a three-winding transformer with impedances Z_{12}, Z_{23}, and Z_{31} the impedance, Z_1, of one winding is equal to $(Z_{31} + Z_{12} - Z_{23})/2$. Similarly Z_2 equals $(Z_{12} + Z_{23} - Z_{31})/2$ and Z_3 equals $(Z_{23} + Z_{31} - Z_{12})/2$.

The use of equations (3) and (4) in connection with unbalanced loads on transformer banks is discussed in the third article of this series.

•

Braces Save Poles On Transformer Racks



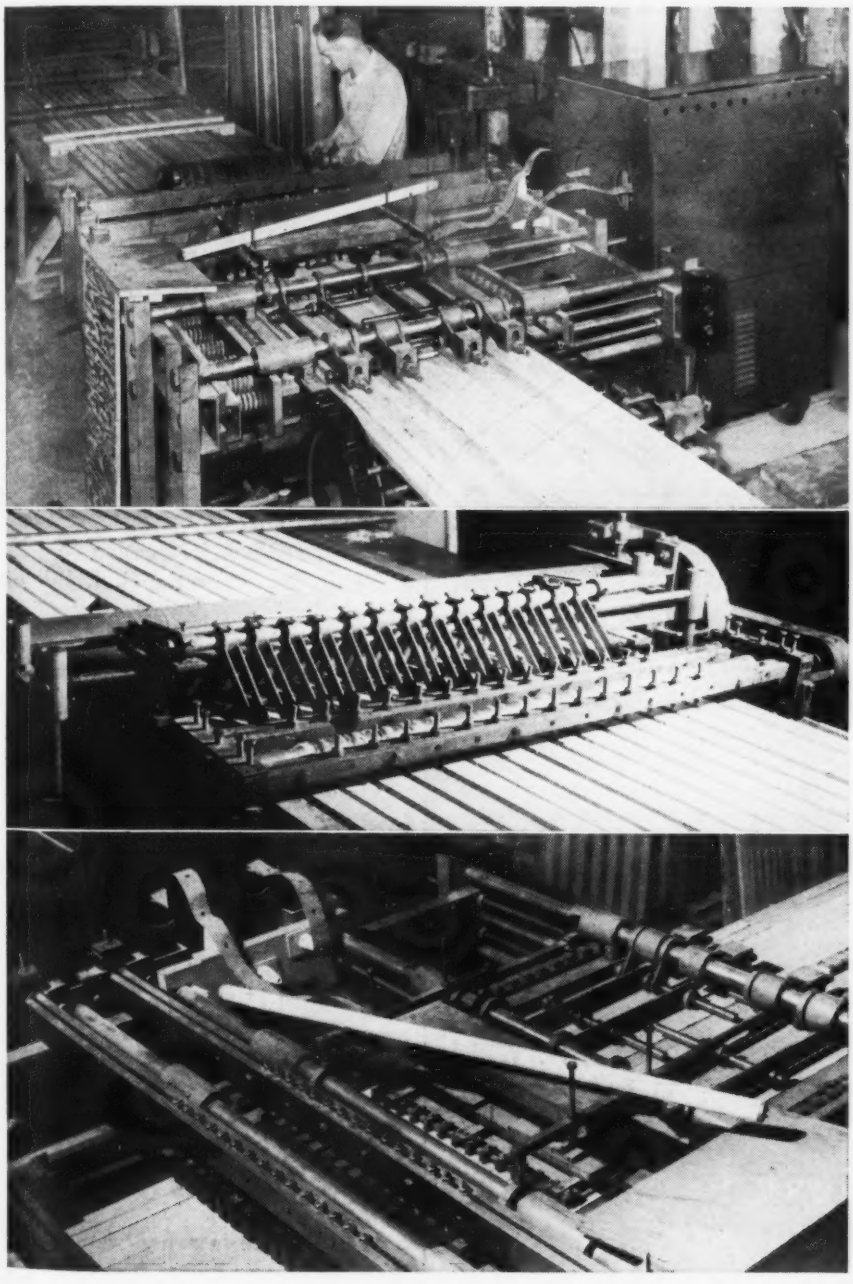
ALLEY ARM quarter braces give added support to transformer structure for three 50-kva. transformer; eliminate need for center pole

ALTHOUGH not original, the use of alley arm braces to eliminate the third pole in transformer structures as illustrated, does effect important savings during the present pole shortage and might well be considered for permanent practice in many situations. The suggestion came from A. J. Lenz, Pacific Gas and Electric Co., Fresno, Calif.

The idea is to use ordinary galvanized steel alley arm braces to eliminate the third, or center supporting pole on timbered platform-type transformer structures. Partly as an outgrowth of this, P.G.&E. has prepared designs for a two-pole transformer structure using two 8-in. steel channels which will be standard for 37½ to 200-kva. transformers.

LOAD BUILDING

Dielectric Heat Used for Continuous Edge Gluing



HIGH-FREQUENCY CONTINUOUS EDGE GLUING MACHINE turns out 36-in. laminated panels from cheap grades of lumber at rate of 10 ft. per minute. Over-all view of operation (top). Close-up of glue spreader (center) and dielectric glue setting machine (bottom). After spreading with glue, strips are forced together under pressure to pass through latter machine. Here, high-frequency current passes through glue line to set the urea resin glue. Fluorescent tube lying on machine is lighted by the high-frequency field and serves to indicate when the electrodes are energized. Electrode shoes may be seen below and slightly forward of the tube

ONE of the very few machines in the country where dielectric heating is used for edge gluing in a continuous process is shown at left. This machine is located in the plant of Laminated Timber Products, Inc., of Portland, Ore.

Process is to edge glue 1 x 2-in. strips into panels up to 36 in. wide. At present the strips are being cut by ripping 2 x 4's into four pieces, although even less expensive lumber can be used—including scraps. Butt joints in the individual strips are staggered, which results in a continuous laminated panel that is sawed to desired lengths.

Spacers between the strips keep them apart while they pass through the glue spreader. Wedge-shaped steel wheels pick up the urea resin quick-setting glue which is then spread on the edges of the strips by bronze springs. As the unglued panel passes into the high-frequency glue setting machine, the strips are forced tightly together by side pressure from flat link continuous chains. Centered above and below the glue lines in the panel are brass electrodes connected to the high-frequency generator.

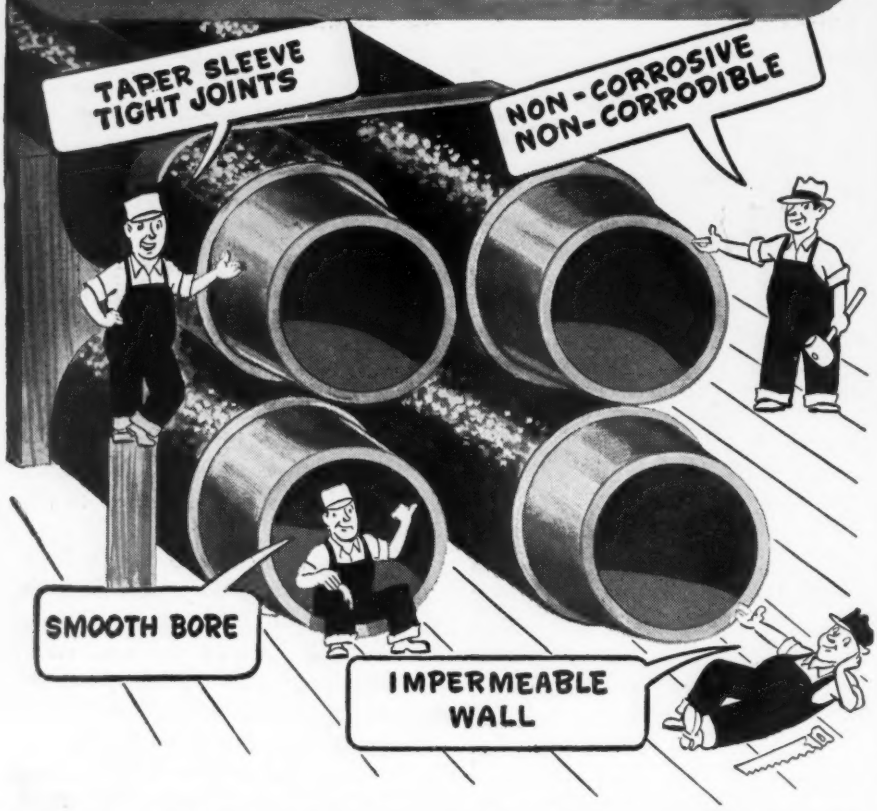
This high-frequency equipment is a Mann-Russell electronic heater, model 200, made by Northwest Syndicate, Inc., of Tacoma, Wash. It is rated 13 kw., 440 volts, single-phase, 27.3 mc., plate voltage 5,150 rms., and plate current 2 amp.

Production Rate

With the amount of heat produced, a lineal panel speed of 10 ft. per minute is possible. A new generator on order of twice the capacity will double the speed at which the panel can be run.

After being cross-cut to length, panels are left rough for veneering or are run through a drum sander to produce a highly finished surface.

FEATURES TO LOOK FOR IN A BETTER CONDUIT



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TAPERSLEEVE JOINTS—IMPERMEABLE WALLS. These features of ORANGEBURG CONDUIT prevent infiltration of ground water or corrosive elements.

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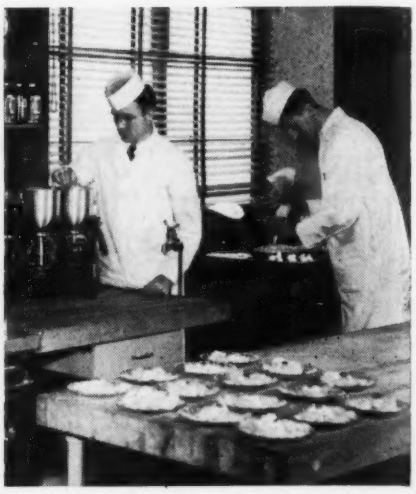


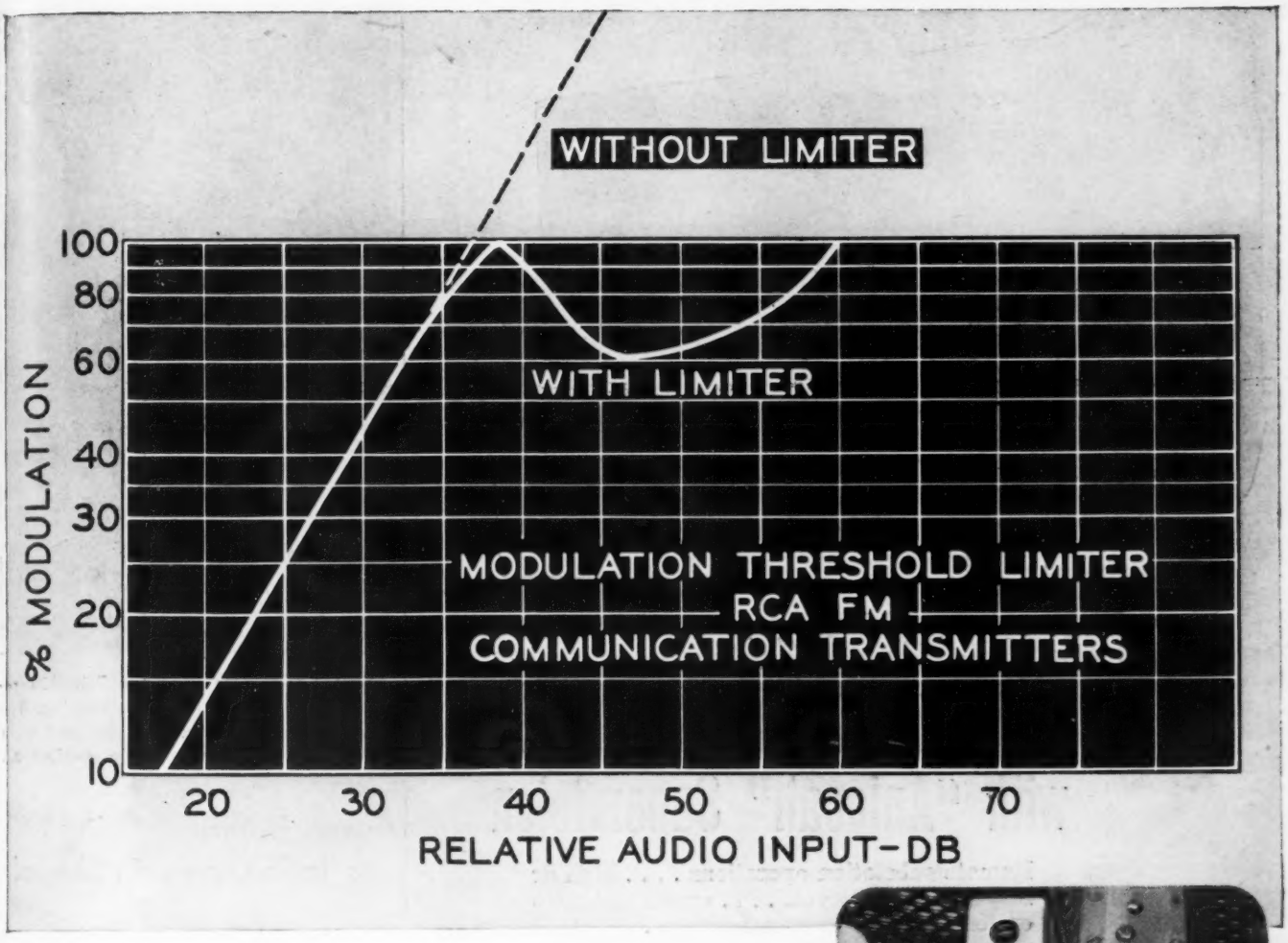
EX-G. I.'S use latest electrical facilities in Connecticut's Restaurant Institute durin 8-month course to qualify them for permanent careers in this field

All-Electric Cooking In Restaurant Course

FAMILIARITY with electric cookery is breeding the very reverse of contempt for it among ex-G. I.'s in training at the Restaurant Institute of Connecticut, Inc. The Institute is equipped with the latest electrical equipment known to the culinary art. Eligible veterans receive instruction, books and supplies under the G. I. Bill of Rights. Eighty students took the first course, with instruction at New Haven, and both elementary and advanced courses have now been established.

Comprehensive courses provide training in restaurant management, food procurement, preparation and service, personal hygiene and sanitation, restaurant accounting, law and government regulations. The electrical equipment of the Institute totals 67 kw., including a 3-section, 16.9-kw. range, a 10.5-kw. broiler, baking ovens, fry kettle, toasters, water heater for coffee making, waffle iron and other facilities. The lighting load totals about 4 kw. and refrigeration, ventilation, etc., about 6 kw. Headquarters are at 169 State St., New Haven.

The Institute is a non-profit vocational school which is operated by a board of directors representing a community-wide committee of business and professional men, with an administrative and a food director. Eben Haskell, commercial and industrial manager of United Illuminating Co., New Haven, is chairman of board.



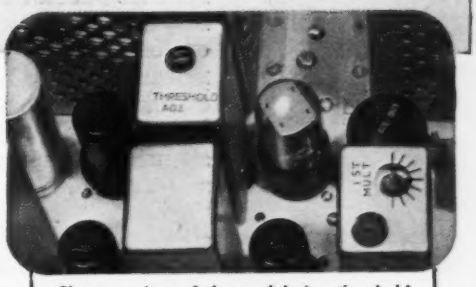
"Shouters... whisperers"

. . . get messages through understandably with RCA 2-way FM transmitters

There's a watchdog circuit in RCA 2-way FM transmitters that pays strict attention to the way you talk. It tames shouts to ordinary conversational level . . . it raises whispers to full understandability.

Known as the RCA Modulation Threshold Limiter, this unique circuit automatically smooths out the rise or fall of your voice . . . regardless of your microphone technique. It sees to it that words come through level and clear.

The Modulation Threshold Limiter is only one of the many important operating features of RCA's 2-way FM equipment . . . 30-44 Mc *and* 152-162 Mc. For complete information, see your RCA sales engineer or write RCA, Communications Equipment Sec., Dept. 29-G, Camden, N. J.



Close-up view of the modulation threshold limiter . . . circuit simplicity plus!

TECHNICAL TIPS ON THE MODULATION THRESHOLD LIMITER

- Produces high-level modulation over a 20-db change of audio input.
- Eliminates transmitter overmodulation
- Insures reduced distortion at the receiver
- Uses a straightforward circuit arrangement with 2 tubes.

For fixed stations For mobile stations

COMMUNICATIONS EQUIPMENT

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

Maintain..

CONTINUITY of SERVICE with "Autocall" Supervision

Remote substation operations . . . . high or low bearing oil levels . . . . excess pressure or temperature in transformers . . . . CO^2 release . . . . in fact, the occurrence of *any* event that is physically perceptible may be instantly and automatically known to responsible personnel by means of "Autocall" supervision!

"Autocall" supervision means *complete* supervision with audible and visual-type annunciators---ranging from the Type ANC unit illustrated above, for use in an Actuator Board, to models 7 feet high or only 6 inches long depending upon your requirements---and an automatically printed log record, in plain English, of all substation and central station operations!

For a complete, illustrated listing of all "Autocall" supervisory and remote control equipment, send for your copy of the photo illustrated booklet shown below, TODAY. There is no obligation.

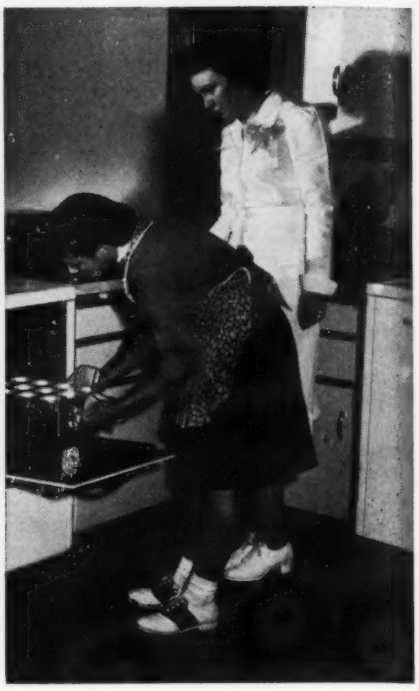
THE Autocall CO.

Established 1908

209 TUCKER AVENUE

SHELBY, OHIO

ALSO MFRS. PAGING, FIRE AND SPRINKLER ALARM SYSTEMS



STUDENT of East Pike Run Township receiving instruction in electric cooking. The students are future homemakers and gain better knowledge of electric equipment.

Teach Electrical Living In Pennsylvania Schools

Y. L. RIPLEY
Electric Home Bureau
West Penn Power Co.
Pittsburgh, Pa.

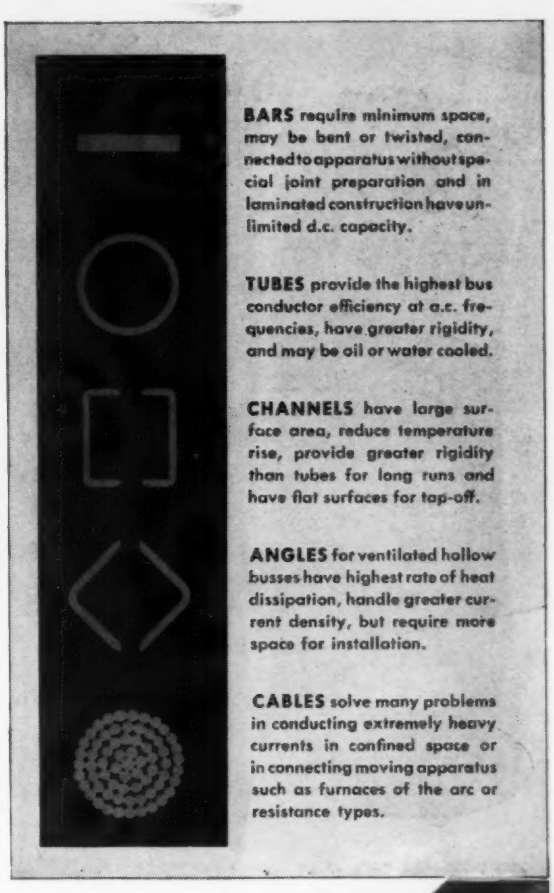
IN the western Pennsylvania territory served by West Penn Power Co., almost 15,000 students are enrolled in home economics classes of schools and colleges. And of this number, 65 percent are being exposed—through actual use of equipment—to the benefits of electrical living. These students are future homemakers—potential buyers of electric appliances. In schools equipped with up-to-the-minute appliances, students not only gain a better knowledge of equipment, but they circulate that knowledge in their families and among their friends.

Manufacturers and distributors recognize the value of getting more equipment installed in schools throughout the territory. In fact, they place so much emphasis on this program that they are offering plans under which special allotments of equipment are made available for classroom instruction.

To encourage the establishment and modernization of home economics departments, properly arranged and

Flat Bars

for SIMPLICITY, ECONOMY and INEXPENSIVE TAP-OFFS



BARS require minimum space, may be bent or twisted, connected to apparatus without special joint preparation and in laminated construction have unlimited d.c. capacity.

TUBES provide the highest bus conductor efficiency at a.c. frequencies, have greater rigidity, and may be oil or water cooled.

CHANNELS have large surface area, reduce temperature rise, provide greater rigidity than tubes for long runs and have flat surfaces for tap-off.

ANGLES for ventilated hollow busses have highest rate of heat dissipation, handle greater current density, but require more space for installation.

CABLES solve many problems in conducting extremely heavy currents in confined space or in connecting moving apparatus such as furnaces of the arc or resistance types.

FLAT BARS require minimum space for making connections to apparatus without the necessity of special joint preparation. The low resistance of the copper and its high thermal conductivity result in low losses and provide an outlet for conducted heat from the apparatus. The bars may easily be bent flatwise or edgewise, or twisted for making the connections.

For heavy currents, due to the large surface area of the laminations, generated heat is readily dissipated. Direct current multi-bar busses with unlimited capacities with adequate copper section and ventilation.

Alternating current busses of flat bars are *limited* in capacity due to unevenness of current distribution in the laminations. 3000 amperes may be considered as the limit of a laminated bus construction for 60 cycles frequency without intricate physical locations of the bars, and without transpositions of the bars.

Anaconda Bus Conductors are available also in four other shapes. Each offers advantages of its own. In addition, because of its high electrical and thermal conductivity, strength, toughness and corrosion resistance, *copper* is recognized as the most satisfactory bus material. Anaconda Publication C-25 contains further information.

47102

ANACONDA
from mine to consumer

Anaconda

BUS CONDUCTORS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ont.

C-O-TWO

STOPS COSTLY FIRES

1. Fire started here. A tiny flame in this maze of pipes, pumps and tanks mushroomed to inferno pitch in minutes. A C-O-Two fire extinguishing system here, with a smoke detector, rate-of-rise or fixed temperature actuator, would have flooded the area with dry, sub-zero carbon dioxide gas and smothered the fire before it had a chance to spread.

2. 10,000 gallons of alcohol sent flames leaping 100 feet above the plant; intense heat drove firefighters away from the blazing building. C-O-Two blankets alcohol, gasoline and other flammable liquid fires in clouds of cooling, inert, oxygen-diluting carbon dioxide gas. It does not scatter blazing liquid.

3. In 30 minutes the roof and two walls had collapsed. A few seconds later, the remaining walls fell.

4. 90 minutes after the fire started—this is all that was left of a $500,000 specialized processing plant—twisted metal and smoking rubbish. C-O-Two systems detect fires at once and put them out instantly, before they cause excessive damage.

If your plant has special fire hazards such as electrical equipment, diesel engines, spray booths, dip tanks, blueprint and record vaults or cooking vats, be sure they are protected. C-O-Two, the modern fire extinguishing agent, is safe to use on live electric equipment; it does not corrode metals, injure fabrics and finishes nor contaminate food. C-O-Two is available in sizes for every type risk: famous Squeeze-Grip portables, wheeled and hose reel units, automatic or manually operated fixed pipe systems, smoke detecting systems and heat-actuated fire detecting systems. A C-O-Two distributor or one of our engineers will help you plan safe, modern fire protection. Write for further information.

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 NEW JERSEY
Sales and Service in the Principal Cities of United States and Canada
AFFILIATED WITH PYRENE MANUFACTURING COMPANY

equipped, the Pennsylvania Department of Public Instructions has provided schools with a very complete bulletin on the subject. It carries the same basic story on equipment as is being told by suppliers.

While plans of various manufacturers and distributors vary in some details, they follow a general pattern about as follows:

1. Equipment is provided, initially, at special prices. This insures a minimum investment on the part of school districts.

2. Replacement of equipment has been provided for, either under a formal annual replacement contract usually running five years, or by encouraging school authorities to replace it annually. For all practical purposes, this combination of special price and annual replacement eliminates obsolescence and schools are always equipped with modern appliances.

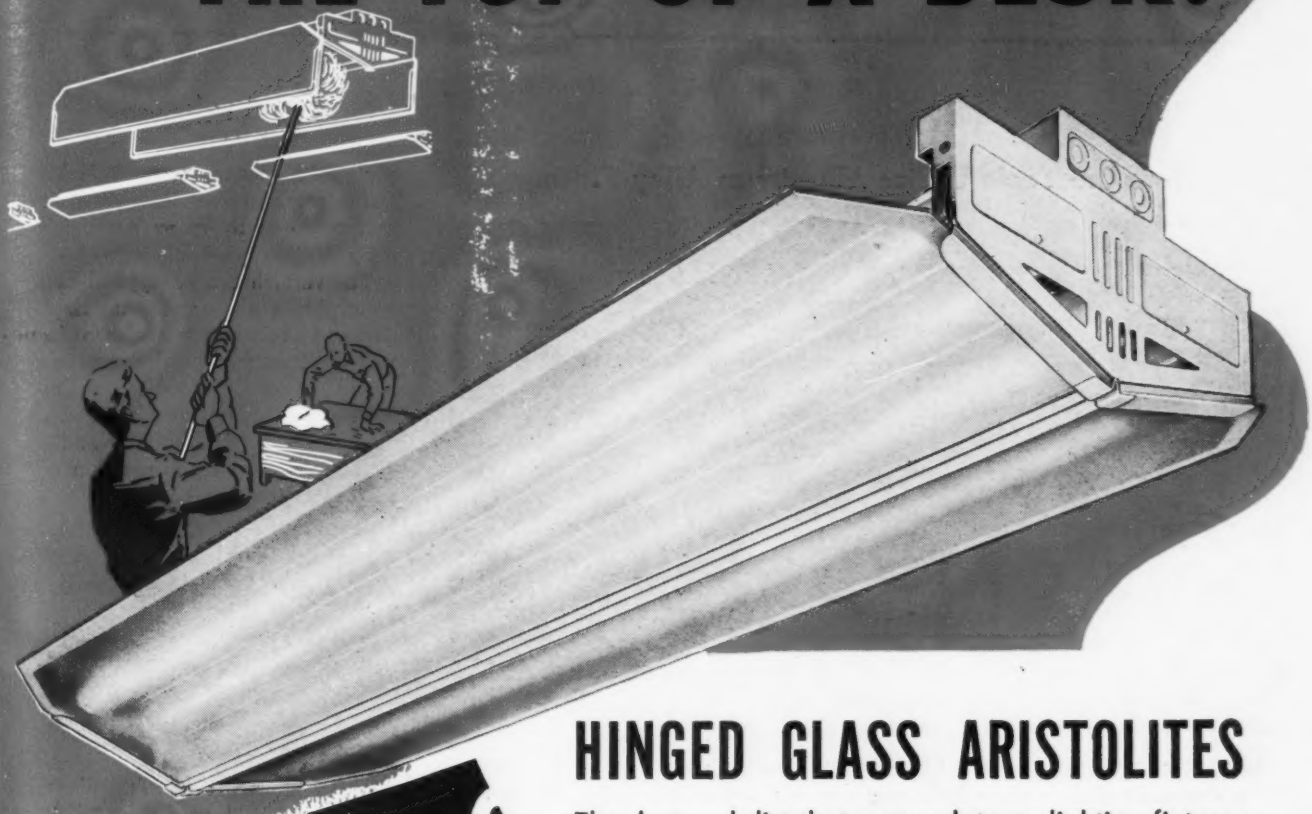
3. Suitable arrangement is made for service, which experience indicates should be provided through dealers.

West Penn's part in this promotional campaign lies in the help and assistance that is offered schools through the use of its representatives from its electric home bureau and home economics and dealer sections. Through their combined efforts, school contacts are made; needed wiring layouts are furnished; information and assistance is given to instructors in the use of the electric equipment and on general classroom arrangement; demonstrations are made available; and liaison service between school boards and equipment dealers is provided.

In 1941, in the territory where West Penn furnishes service, of the 119 secondary schools having home economics departments, only 49 electric ranges were installed in 34 schools. Today, 118 electric ranges are in use in these schools for instruction. The number of schools using electric ranges has jumped to 75—raising the percentage from 28 to 65. And obsolete models have been largely replaced in original installations.

While interest centers in the electric range, other items such as electric sinks, automatic laundries, refrigerators, mixers, roasters, sewing machines and the like are considered as important adjuncts to well-equipped classrooms.

AS EASY TO DUST AS THE TOP OF A DESK!

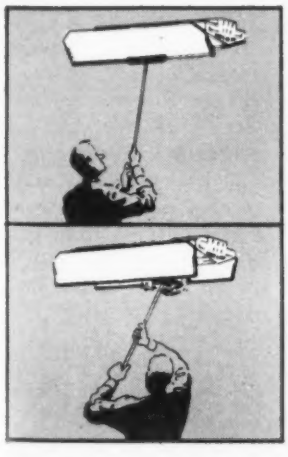


HINGED GLASS ARISTOLITES

The dust and dirt that accumulate on lighting fixtures rob users of much of the illumination they are paying for. Frequent dustings are good business economy.

Now, with GUTH Hinged Glass Aristolites*, the entire dusting operation can be done regularly . . . easily . . . safely . . . *right from the floor!* A simple gripper on the end of a pole swings the glass panels free on their GUTH Floating Hinges. Then a duster on the opposite end of the same pole cleans the fixture, and the panels are quickly reseated.

Dusting the Aristolites is just a simple part of the regular weekly routine . . . as casual as dusting the desks!



WHY EXPECT PORTERS TO BE ACROBATS!

It's a dangerous, wasteful misuse of manpower for cleaners to scurry up tall ladders, balance awkward glass panels precariously, dust them, juggle them back into position, and then clamber down again. Needless, too, when the whole job can be easily and much more quickly done . . . right from the floor . . . with GUTH Hinged Glass Aristolites!

AT LAST! THE LUMINAIRE THAT MAKES THE DUSTING LADDER OBSOLETE!

Write today for full information about this amazing new Fluorescent Luminaire . . . the GUTH Hinged Glass Aristolite with the Floating Hinge.

*Trade Mark Registered—Patent Pending

OUR 45th ANNIVERSARY Year

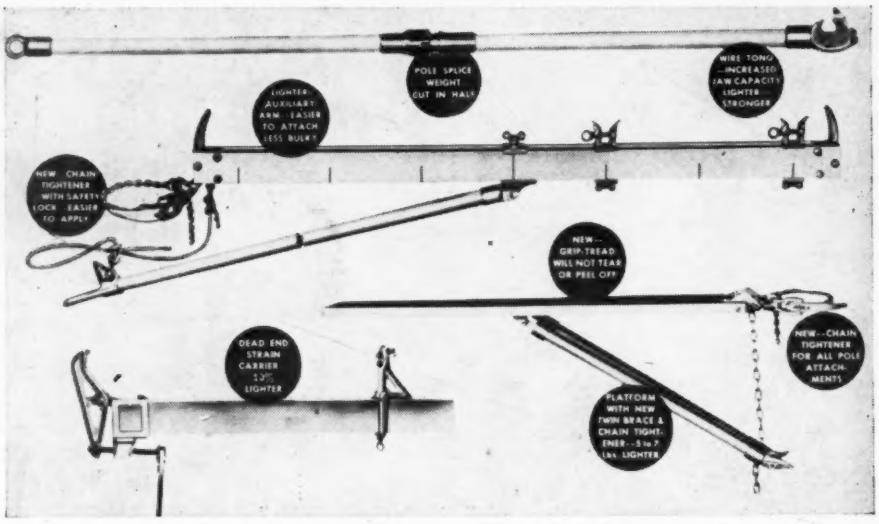
Leaders in LIGHTING Since 1902

THE EDWIN F. Guth COMPANY

2615 WASHINGTON AVE. ST. LOUIS 3, MISSOURI

NEW EQUIPMENT

Hot Line Tools Utilize Aluminum Alloy Fittings


POLE SPLICE WEIGHT CUT IN HALF
WIRE TONG —INCREASED JAW CAPACITY LIGHTER STRONGER
NEW CHAIN TIGHTENER WITH SAFETY LOCK EASIER TO APPLY
NEW— GRIP-TREAD WILL NOT TEAR OR PEEL OFF
DEAD END STRAIN CARRIER 20% LIGHTER
NEW—CHAIN TIGHTENER FOR ALL POLE ATTACHMENTS
PLATFORM WITH NEW TWIN BRACE & CHAIN TIGHTENER—5 to 7 lbs. LIGHTER

HOT LINE TOOLS with heat treated aluminum alloy fittings have been announced by A. B. Chance Co., Centralia, Mo. The company reports that, in addition to decreased weight, greater strength, greater tool versatility and easier operation result.

The above mentioned tools include a special chain tightener with lever action and safety lock; twin braces for platforms; dead end strain carrier; and wire tongs.

Tools are illustrated. The new chain tightener is stated to be easier to apply; the dead-end strain carrier, 20 percent lighter; the platform with the new twin brace and chain tightener, 5 to 7 lb. lighter; and pole splice weight halved.

•

15,000-Lumen Lamp Usable in New Street Light Globe

A PRISMATIC GLOBE which will accommodate a 10,000- or a 15,000-lumen filament lamp or a 16,000-lumen mercury lamp has been announced by the General Electric Co., Schenectady, N. Y. It is stated to be the largest bowl refractor made and is applicable to freeways, urban highways, boulevards, main traffic arteries, and secondary business streets.

Light from the globe emanates in two principal beams up and down the street. Factors in its usual application are stated to be minimum street width of 60 ft., need for large size lamps, desirability of 0.8 foot-candles or more, and the economies of maximum spacing.

•

Clear Baking Varnish For Coated Magnet Wire

AN ALL-PURPOSE insulating varnish known as Synthite AJR-7 with a Bakelite base has been announced by John C. Dolph Co., Dept. 10, 1060 Broad St., Newark 2, N. J. It is stated to be especially adapted or use on all types of round coils with coated magnet wire such as Formvar, Formex, Nylon and Glass, providing a build-up heavier than that afforded by many previously formulated thermosetting varnishes.

The varnish can be applied by either atmospheric dip or vacuum impregnation and according to the manufacturer will produce very good results whether baked under infrared or in electric heated ovens. It is said to have a high degree of dip tank stability and is easily handled in both production and repair shop treating cycles.

•

Analyzer Measures Voltage, Current, Resistance

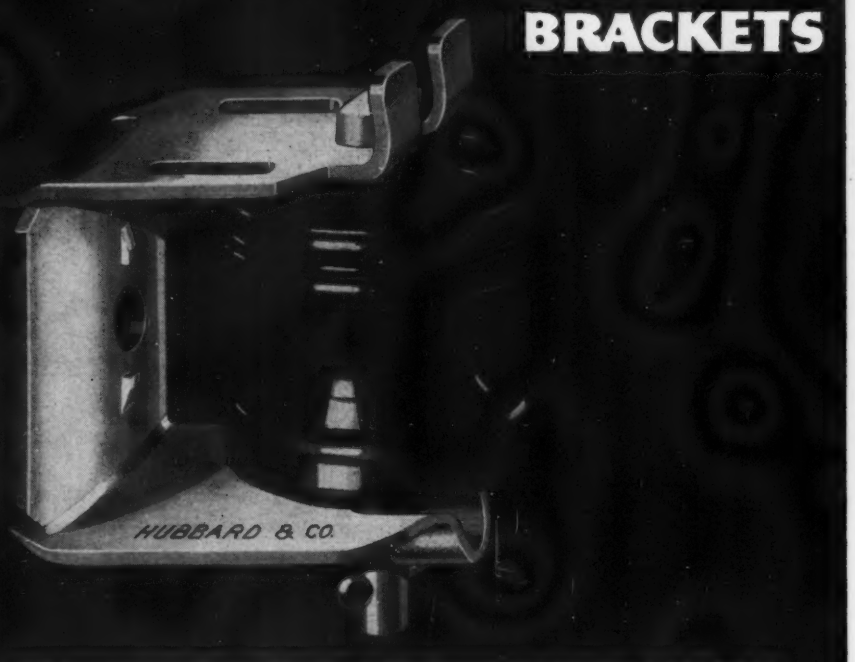
A NEW, compact electronic analyzer, providing facilities for accurate voltage, current and resistance measurements covering frequency ranges of practically all present electronic applications, has been announced by the Weston Electrical Instrument Corp., Newark 11, N. J.

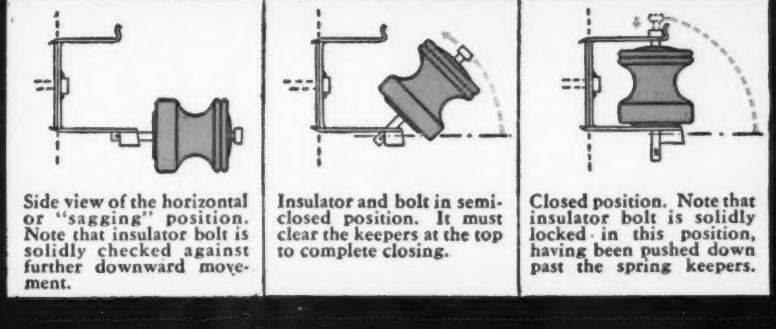
Known as Model 769, it embodies within one instrument a vacuum-tube voltmeter for measurements on frequencies up to 300 megacycles, an electronic volt ohmmeter, and a 10,000-ohm-per-volt d.c. and 1,000-ohm-per-volt a.c. multimeter. It is completely line isolated and line insulated to reduce external radio-frequency influence.

The vacuum tube voltmeter is reported to be stable over wide variations in line voltage and covers a frequency range of 50 cycles to 300 megacycles without accessories or adapters, at ranges of 3/12/30/120 volts. Accuracy is 5 percent to 150 megacycles, and 12

Something NEW IN SECONDARY DISTRIBUTION

HUBBARD SAGGER BRACKETS

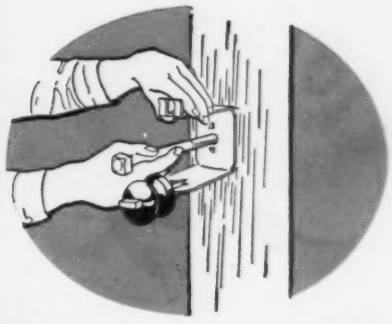




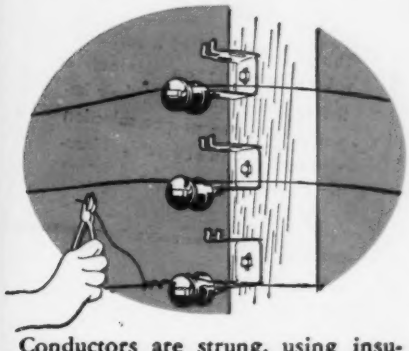
Side view of the horizontal or "sagging" position. Note that insulator bolt is solidly checked against further downward movement.

Insulator and bolt in semi-closed position. It must clear the keepers at the top to complete closing.

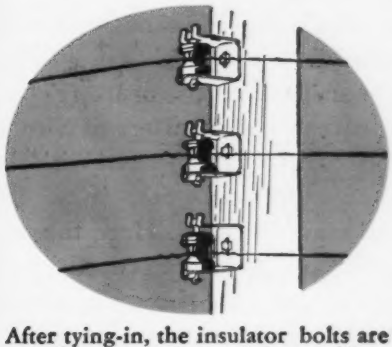
Closed position. Note that insulator bolt is solidly locked in this position, having been pushed down past the spring keepers.



Holes are drilled at correct spacing and machine bolt is inserted as shown.



Conductors are strung, using insulators as pulleys, until desired sag is obtained after which they are tied-in while still in the horizontal position.



After tying-in, the insulator bolts are raised to the vertical and dropped into the lock position.

For secondary distribution circuits, where a variety of problems are to be met, Hubbard No. 710 Sagger Bracket is the most flexible choice to meet the requirements. This Bracket may be described as a single, *separate,* secondary-rack point, which may be used with one or more similar points, at any desired spacing for any number of conductors.

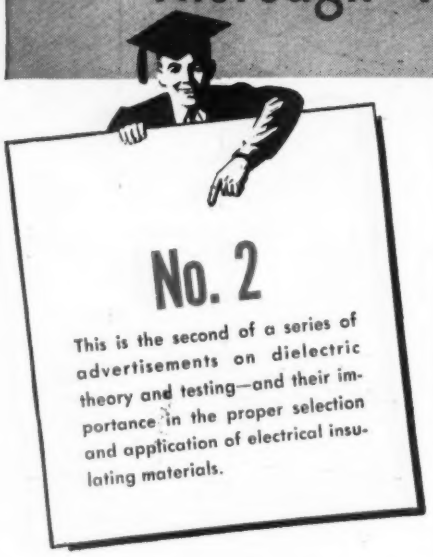
No. 710 Brackets are versatile in other ways also. The patented feature is the arrangement of the insulator bolt which may be dropped to a horizontal position to allow the "sagging" of conductors with the insulator spool acting as a pulley. Insulator Bolts are locked in position when closed or open. Strength against line pull is provided by the broad back bearing against the pole, the backs being 3-inches in width. Spurs at the corners prevent the bracket from turning during and after installation. Bolt heads are trapped in the back to prevent turning while tightening.

Hubbard Sagger Brackets have been tested and proved in service. Highly adaptable to any conditions, they have drawn praise from engineers, in every instance of the many installations made to date.

HUBBARD AND COMPANY

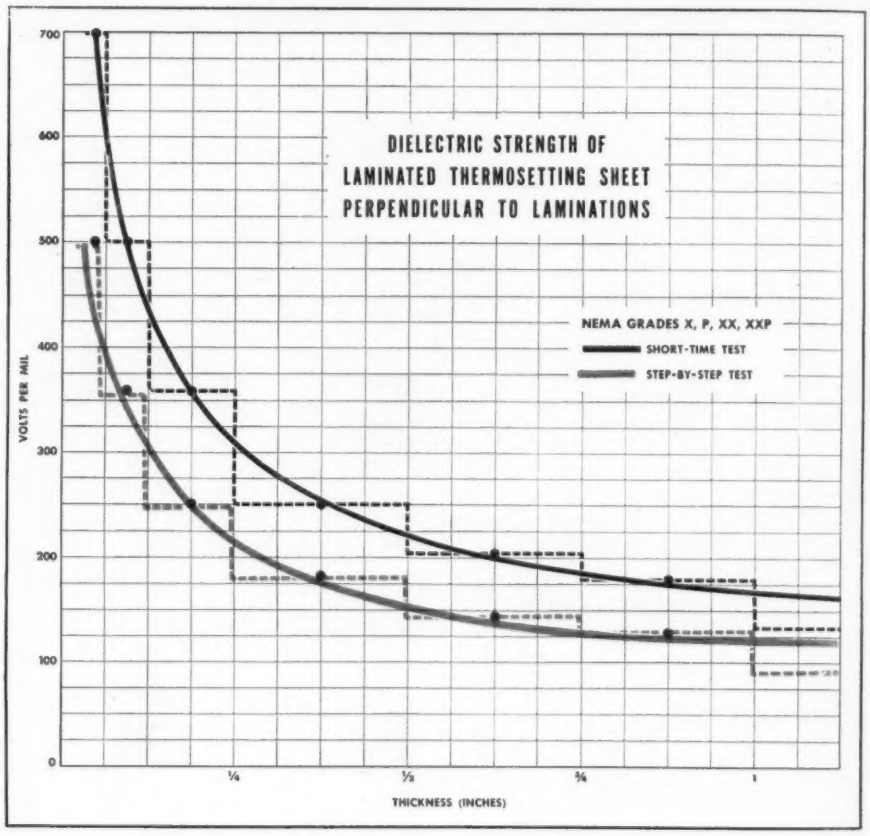
PITTSBURGH • CHICAGO **OAKLAND • CALIFORNIA**

Thorough Knowledge of Dielectric Strength



No. 2

This is the second of a series of advertisements on dielectric theory and testing—and their importance in the proper selection and application of electrical insulating materials.



Dielectric strength values of insulation, determined by means of laboratory tests, are seldom exactly like those obtained in actual service. To be the same, all factors that affect dielectric breakdown would have to be identical.

For instance, the chart (Fig. 1) illustrates the values of Short-Time Tests[1] as compared with the values of Step-by-Step Tests[2] for the same material. Here the test specimens have been conditioned alike, tested in the same atmosphere, at the same temperature and with the same electrodes. The only variation was the rate at which the voltage was applied. Since all the variables mentioned above have an effect on dielectric breakdown, it can easily be seen that test values are but an indication of dielectric quality.

For this reason, the American Society for Testing Materials has set up detailed standard test procedures for each type of insulating material. Thus, a common basis is established for comparing the dielectric quality of one material with another. And it is possible to compute, fairly accurately, what the dielectric strength will be for the same insulation under other conditions, by starting with a value that has been determined by a standard test.

STEP-BY-STEP DIELECTRIC STRENGTH TEST

The first advertisement of this series dealt with the Short-Time Dielectric Strength Test, devised for quick determination. Here the Step-by-Step Method is outlined. This means of determining dielectric breakdown, where the voltage is applied for longer periods of time, simulates to a certain extent operating conditions of many applications where the electrical insulation is under extended stress. The Step-by-Step values should therefore be used when considering such applications.

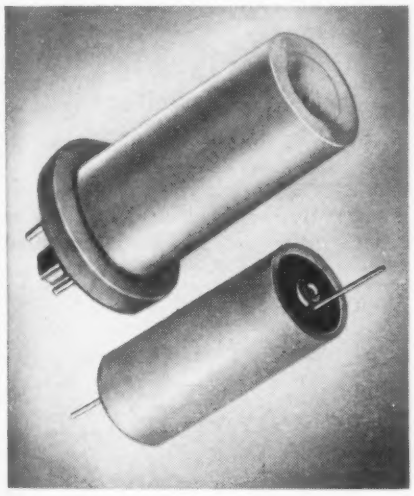
The electrical equipment needed to perform the Step-by-Step Test is the same as that needed for the Short-Time Method (step-up transformer, automatic circuit breaker, device for controlling rate of voltage rise, voltmeter and electrodes of proper size and shape). In this procedure, however, the initial voltage applied (50% of the breakdown in the Short-Time Test) is held for a specified time, then increased by equal increments to higher voltages, but held at each step for a definite period of time as stated in the ASTM specifications.

[1]ASTM Designation D149-44-10(a)
[2]ASTM Designation D149-44-10(b)

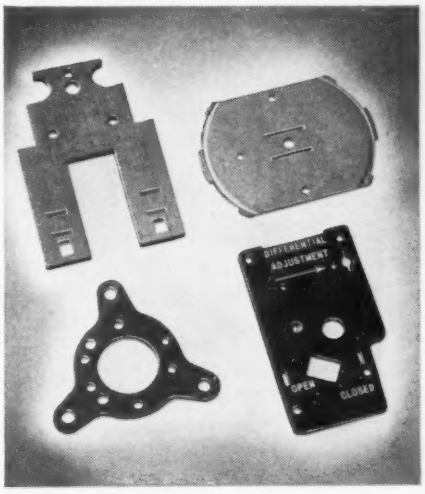
Lengthens Life of Many Electrical Products

APPLICATIONS OF ELECTRICAL INSULATING MATERIALS

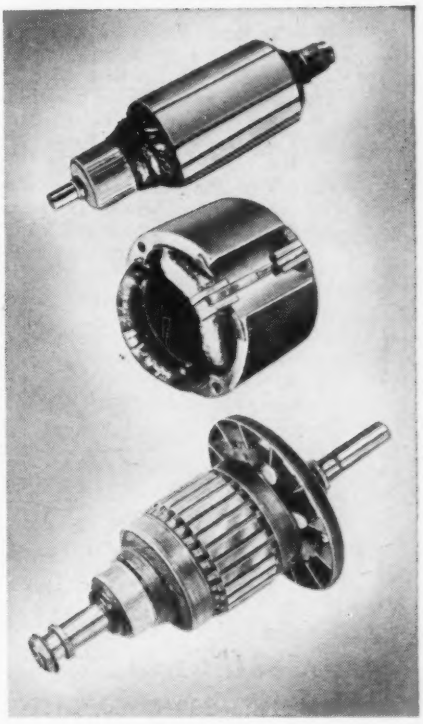
Mica Insulator Company makes a wide variety of insulating materials, thus giving the designer and manufacturer a free hand in specifying a dielectric to meet the exact conditions of use. Products include, for example, fabricated *Munsell Mica* (machined to specifications); *Micanite* and *Super-Micanite* (built-up mica); *Lamicoid* (laminated plastic); *Empire* (varnished fabrics and papers); and *Miscellaneous Insulations* (tubing, untreated tapes, fiberglas products and varnishes).



EMPIRE YELLOW-VARNISHED CONDENSER PAPER is free from impurities that may impair insulation qualities. Furnished in thicknesses of 1.5, 2 and 3 mils, its extreme thinness makes it suitable for magneto, induction and ignition coils, condensers, etc.



LAMICOID SHEETS NEMA Grade XXX are made with paper base and high quality synthetic resins. They are particularly well suited for radio parts and similar applications where at high frequency, low-loss characteristics must be maintained under severe conditions.



MICANITE SEGMENT PLATES are made with both amber (phlogopite) and India (Muscovite) mica. They have proved exceptionally valuable for most flat-insulation applications, punched segments, undercut and flush-type commutator segments, washers and discs.

Experience accumulated by Mica Insulator Company as electrical insulation specialists for over 50 years, plus knowledge gained from extensive research, can help solve your insulation problems. Call on our Technical Service Department—there is no obligation.

Insulator COMPANY

SCHENECTADY 1, NEW YORK

Atlanta • Birmingham • Boston • Chicago • Cincinnati • Cleveland • Detroit • Houston
Los Angeles • New York • Philadelphia • Rochester • St. Louis • San Francisco

MICO
ELECTRICAL
INSULATION

Trade-mark

TEST

. . . for volts, amperes, or watts with this one small, compact instrument

Here is the first appliance tester ever made that gives you volt, ampere, and wattage readings all from one small, compact instrument.

Model 390 slips easily into a large pocket, weighs only a pound and a half, is designed for hard, continuous service.

The range of uses for this volt-amp-wattmeter is almost unlimited in checking line voltage, current drain and power consumption, the three simple tests which will diagnose most cases of electrical trouble. In fact, practically any household electrical appliance that has a motor or a heating element, can be tested by the 390, as well as certain industrial installations.

You merely plug Model 390 and appliance to be tested into the Break-In plug furnished—voltage will read. To read watts or amperes, simply press one of the two buttons at bottom of the panel.

Aside from its unique features, Model 390 has no equal among appliance testers in quality alone. The famous Simpson quality makes investment in the Model 390 an investment that will return a rich yield in satisfactory service through the years.

USE MODEL 390 FOR TESTING

Refrigerators	Motors
Deep Freezers	Electric Heaters
Washing Machines	Radio Sets
Irons	Lamps
Toasters	Vacuum Cleaners

and all similar appliances

RANGES

A.C. Current, 60 Cycles

Volts: 0-150, 0-300.

Amperes: 0-3, 0-15.

Watts: 0-300, 0-600, 0-1500, 0-3000.

Size: 3" x 5⅞" x 2½". Weight 1½ lbs.

Shipping weight 3 lbs.

Price, with Break-In plug and leads $39.50

Leatherette carrying case, with leads compartment $4.00

Genuine leather carrying case, with leads compartment $8.00

Simpson Model 390 Volt-Amp-Wattmeter

SIMPSON ELECTRIC COMPANY
5200-5218 W. Kinzie St., Chicago 44, Illinois
In Canada Bach-Simpson, Ltd., London, Ont.

Simpson

INSTRUMENTS THAT STAY ACCURATE

percent from 150 megacycles to 300 megacycles, direct reading, the company reports. Use of a corrective curve reduces this to 8 percent on 150 megacycles to 300 megacycles, it is stated. Input resistance is 5 megohms; capacity, 5 micromicrofarads. Power requirements are 105 to 130 volts, 50 or 60 cycles a.c.

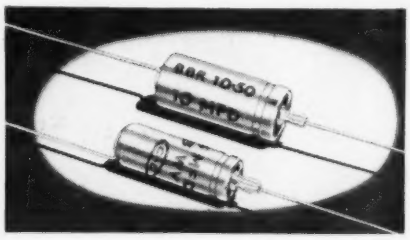
The electronic volt ohmmeter covers ranges from 3 to 1,200 volts, and 2,000 ohms to 2,000 megohms full scale. Electronic zero balance is unaffected by zero adjustments to the ohmmeter, the company reports. Power requirements are 105-130 volts at 50 to 60 cycles.

The analyzer provides six 10,000-ohms-per-volt voltage ranges, six rectifier type a.c. voltage ranges to 1,200 volts, three ohmmeter ranges to 200,000 ohms, and six d.c. ranges to 600 milliamperes. A special d.c. probe containing a 5-megohm resistor is furnished for measuring d.c. potentials. Standard test leads also are provided. Power supply is self-contained.

•

Electrolytic Capacitors For Compact Assemblies

A NEW super-small version of their famous type BR electrolytic tubular capacitors has recently been announced



by Cornell-Dubilier Electric Corp., South Plainfield, N. J. Designated Type BBR, the new units are designed for use in ultra-compact assemblies which call for low-voltage, high-capacity capacitors in miniature size. They are hermetically sealed in cylindrical aluminum containers. The negative lead is riveted to the case at one end, while the positive lead is anchored to a specially designed terminal brought out through a Bakelite washer at the other. Specifications and dimensional drawings are in special Bulletin No. 100-424, supplied without charge by the manufacturer.

•

"Powder Fine" Flux Produces Nonporous Welds

A NEW WELDING FLUX, called Thermo-Lo Blue, is being introduced by Farrelloy Co., 1243 North 26th St., Philadelphia 21, Pa., for use where strength,

SPERO "LVR"-gives the performance needed for ENGINEERED LIGHTING

SPERO "LVR"-448

Louvre-shielded commercial fluorescent luminaire —an achievement in lighting engineering.

...HERE IT IS ...in BLACK and WHITE

PROPERLY ENGINEERED for "ENGINEERED LIGHTING"

Spero "LVR" meets the three basic requirements for good "engineered lighting"— high efficiency, low maintenance, and smart appearance. Light from the 40 W tubes is shielded by evenly spaced louvres. Individual reflectors, removable for easy maintenance, provide a reflecting surface for each tube. Reflecting surfaces are finished in "Plastox" white (86% Reflection factor).

Starters can be replaced without disturbing either the tubes or the hinged louvres. Relamping is done from the top, on pendant-mounted units, and by swinging down the louvre on surface mounted units. Plastic side panels add to the appearance and utility of this fixture. Available with instant-start ballasts.

Write for your copy of the Candlepower Distribution Curve on Spero LVR-448.

Spero also manufactures REFLECTORS, FLOODLIGHTS, VAPOR-PROOF UNITS, and various MATERIALS FOR ELECTRICAL CONSTRUCTION. Write for Bulletin No. 10.

ELECTRICAL TESTING LABORATORIES, INC.
NEW YORK, N. Y.

REPORT NO. 316679 ORDER NO. 11945-L PLATE NO. 52931

CAT. NO. LVR-448 FOUR-40-WATT LAMP SUSPENSION MOUNTED FLUORESCENT UNIT
CANDLEPOWER DISTRIBUTION

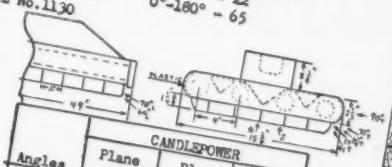
Tested in accordance with Specifications for Fluorescent Luminaires - Type - Semi-Direct
Rendered to Spero Electric Corporation

Lamps - Four - 40 Watts; 118 Volts; 2320 Lumens; T-12 White Fluorescent.
Unit - White synthetic enamel reflector, reflection factor 0.88; frosted plastic sides; white synthetic enamel eggcrate louvers, reflection factor 0.88.
Test - Candlepower distribution in three vertical planes intersecting in the center of the unit; A-A normal, B-B parallel and C-C 45° to the tubes.

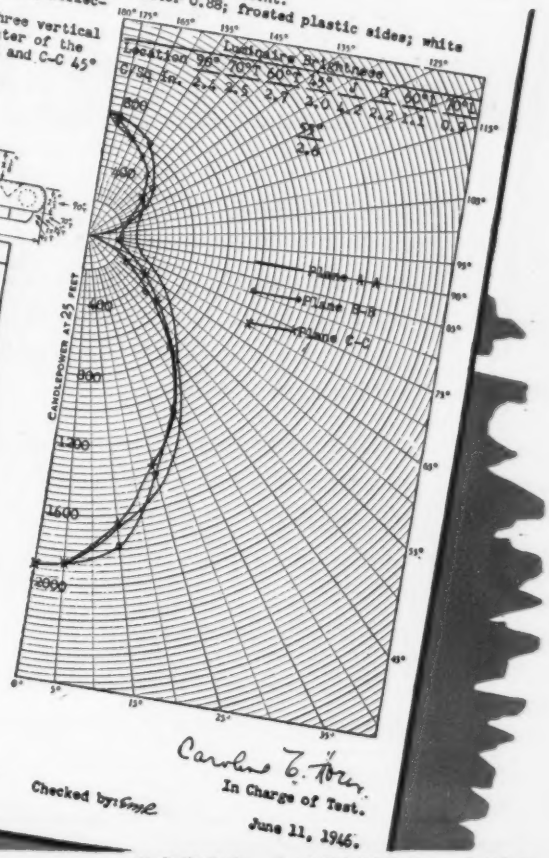
Light output in per cent of bare lamps

0°-60° - 34	90°-180° - 22
0°-90° - 43	0°-180° - 65

*ETL No. 1130



Angles	CANDLEPOWER Plane A-A	Plane B-B	Plane C-C
180°	700	700	700
175°	630	700	675
165°	600	670	610
155°	540	620	545
145°	490	535	482
135°	394	458	391
125°	345	366	296
115°	306	225	215
105°	291	112	195
95°	283	29.6	176
90°	275	9.2	160
85°	298	35.8	180
75°	369	137	260
65°	520	275	381
55°	680	465	535
45°	865	785	795
35°	1190	1110	1120
25°	1500	1410	1360
15°	1670	1780	1660
5°	1870	1870	1870
0°	1900	1900	1900



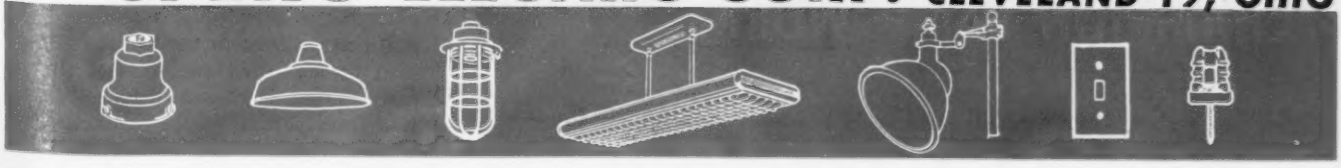
Report Approved by
Engineer, Photometric Department.

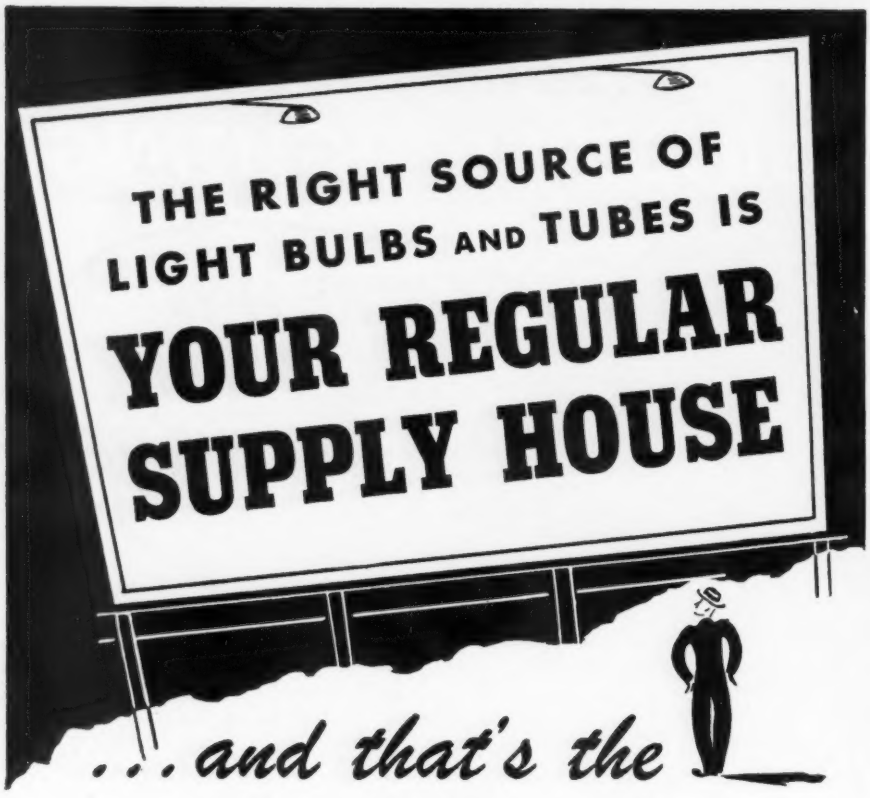
Tested by: Lw Plotted by: Zf Computed by: CZ Checked by: Gmc

Caroline E. Town
In Charge of Test.

June 11, 1946.

The SPERO ELECTRIC CORP. 18222 LANKEN AVE. CLEVELAND 19, OHIO





. . . and that's the place to buy your . . .

CHAMPION *Lamps*

The makers of CHAMPION **Fluorescent** and *Incandescent* Lamps recommend that you buy electric lamps in the same proved efficient and economical way that you buy other supplies — from the local electrical or industrial distributor who is familiar with your needs, is in constant touch with you, is able to serve you promptly and intelligently.

Champion Lamps are manufactured and distributed to provide high quality, low cost industrial light. The Champion Lamp Works specializes in industrial lamp applications and maintains trained lighting experts in the field to give you reliable, unbiased counsel on the right lamps and lighting for every part of your plant and offices.

It's to your advantage to standardize on Champion Lamps and get them from your local Champion distributor.

CHAMPION LAMP WORKS

Lynn, Massachusetts

A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

machineability and nonporous welds are required. It is dehydrated in manufacture and ground to the fineness of face powder, the company reports.

These features are said to make a flux that sticks to the welding rod and does not lift off the work while the temperature is being raised. It is also reported to make possible welding at low temperatures.

•

Photoelectric Counter Is "Packaged" Unit

A NEW photoelectric counter, No. 153, designed as a package unit to simplify installation, has been introduced by

Ripley Co., Inc., Middletown, Conn. The light source, phototube and counter are built in one housing, thereby eliminating external wiring.

The control operates on interruption of reflected light from a swivel type, adjustable, chrome reflector. The unit operates on a 115-volt, 60-cycle circuit. Sensitivity adjustment, which permits setting for various light intensities, can be reached through an aperture in the housing.

The relay is rated at 3 amp. continuously for 8 million impulses. Minimum time for one operation is reported as 0.08 seconds or 700 cycles per minute. Minimum duration of beam interrupting a 1-in. object is 0.02 seconds. Minimum light intensity is 2 foot-candles; maximum, 1½ foot-candles, for slow-moving objects. Maximum number of counts before returning to 0 is 99,999.

•

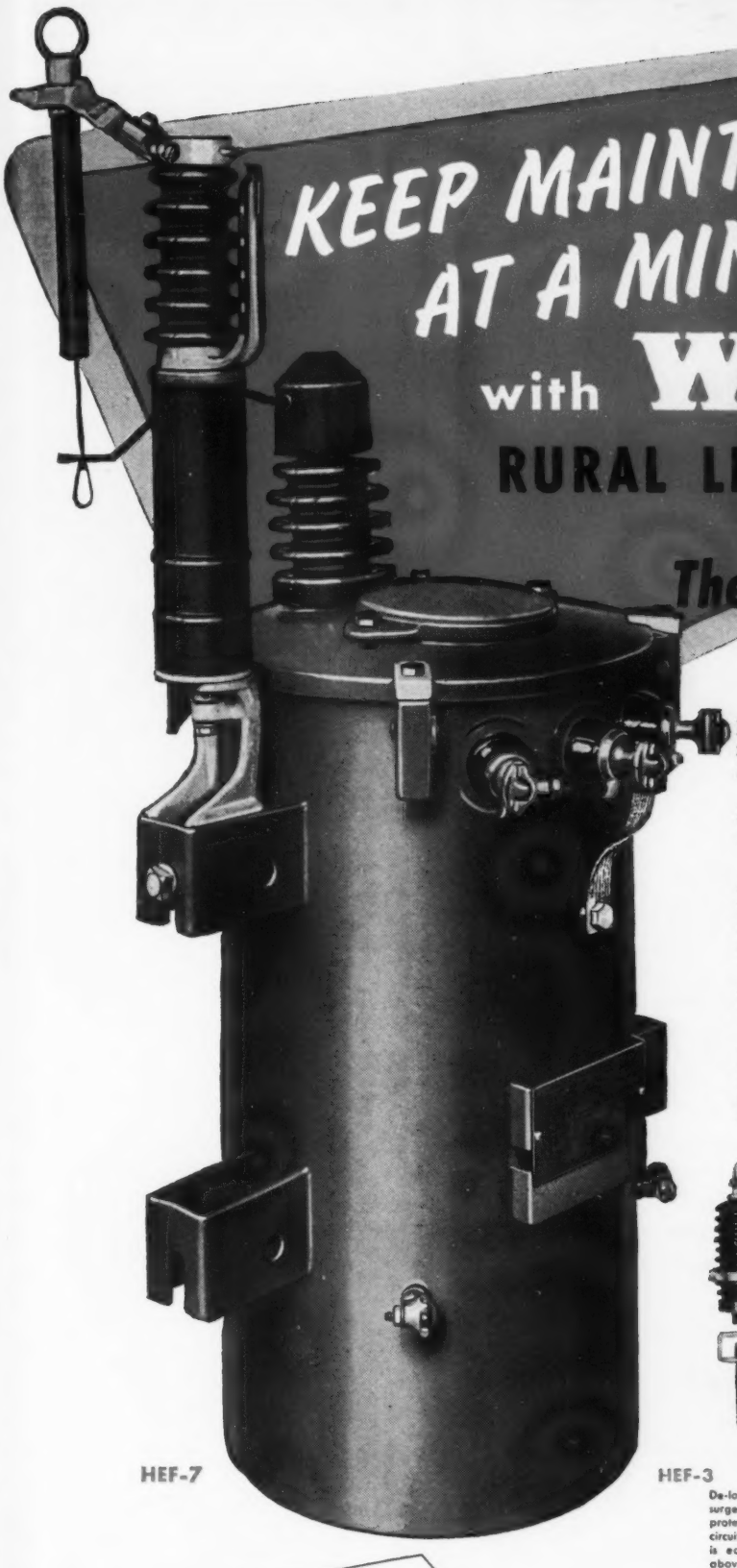
Recloser Designed For Rural Lines

A SINGLE-POLE, metal-tank reclosing breaker weighing only 65 lb. for service on rural lines up to 15,000 volts is announced by Westinghouse Electric Corp. Designed for completely automatic operation, the force of the overload current is used to open the breaker and to store energy for reclosing.

Either four, time-lag tripping operations before lockout or two instantaneous operations followed by two time-delay ones and lockout can be selected by changing a pipe plug, an adjustment that can be done in the field by a lineman in less than one minute. When fast tripping is chosen, the first operation from parting of the contacts until

KEEP MAINTENANCE AT A MINIMUM... with Wagner RURAL LINE TRANSFORMERS

They Provide Dependable Efficient Service!



HEF-7

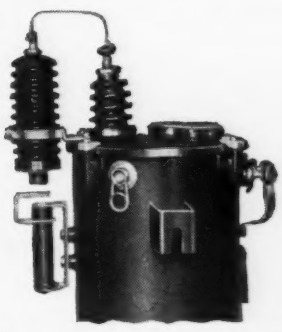
In all types of Rural Lines you will find Wagner Transformers giving service that will keep maintenance at a minimum and provide the utmost in safety.

Three types of Wagner Rural Line protected Transformers are illustrated. Each is provided with protective equipment to best suit the needs for which it is designed.

Type HEF-7, illustrated at left has Joslyn Lightning Arrestor to provide surge protection and a primary fuse to provide protection against overloads. A blown fuse can be quickly replaced, reducing the time required to put the transformer back into service.

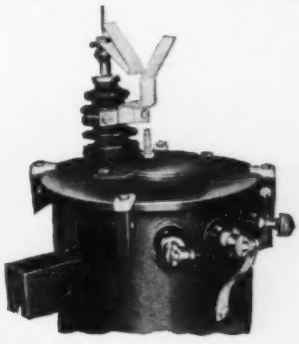
Types HEF-5 and HEF-3 are described below. For complete information on these outstanding Rural Line Transformers, write for Bulletin TU-1C.

Wagner manufactures a complete line of Rural Line, Power, and Distribution Transformers and Unit Substations. 29 branch offices located in principal cities provide nationwide service facilities. Wagner Electric Corporation, 6456 Plymouth Ave., St. Louis 14, Mo.



HEF-3

De-Ion Gap on high-voltage side provides surge protection; secondary circuit-breaker protects transformer against secondary short-circuits and overloads. Breaker reset handle is easily accessible; on sizes 5-kva and above, a warning signal light is built into the reset handle.

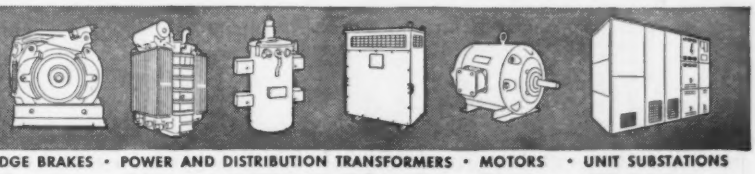


HEF-5

Double "bird-proof" gap provides surge protection; internal fuse forms a protective link between the transformer and the high voltage line. When the double gap and internal fuse are combined no other surge protection or transformer fuses are required.

Consult Wagner Engineers on All Transformer Problems

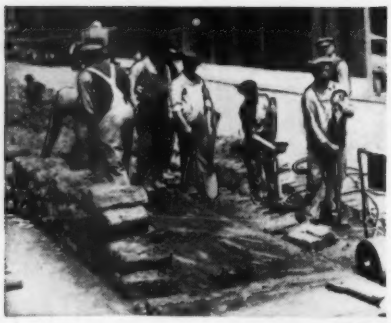
Wagner Electric Corporation
EST. 1891



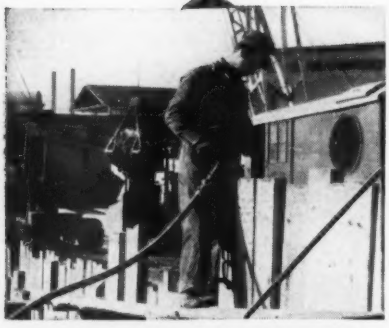
T47-18

BRIDGE BRAKES • POWER AND DISTRIBUTION TRANSFORMERS • MOTORS • UNIT SUBSTATIONS

ELECTRICAL AND AUTOMOTIVE PRODUCTS



Utilities use
SCHRAMMS
on jobs like these



Four of many uses of Schramm Air Compressors in the Utility field. No matter how tough the job, or where it is, the versatile Schramm is a hard-hitter that furnishes air easily, quickly, economically.

Schramm features. (1) Watercooling 100% (2) Forced Feed Lubrication (3) Mechanical Intake Valve (4) Compact lightweight units, easily moved about.

Today Utilities throughout the country are using Schramm Air Compressors. There's a wide range of Schramms to select from, ranging from 20 to 420 cu. ft. actual air. We invite you to write us today for complete details on our many models.

Let **SCHRAMM**
help you on your compressed air job!

SCHRAMM
INC.
THE COMPRESSOR PEOPLE
WEST CHESTER • PENNSYLVANIA

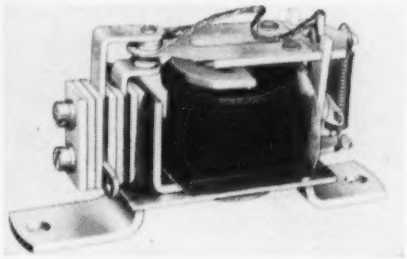
they close is accomplished in the ultra-short time of twelve cycles or less. Close coordination with fuses is thus made possible. The breaker is said to be completely self-protected against burnouts and damage by lightning.

The type GR reclosers are available for crossarm, direct-pole or extended pole-bracket mounting in 5, 10, 15, 25, 35, and 50-amp. ratings with interrupting capacities from 150 amp. at the 5-amp. rating to 1,200 amp. at the 50-amp. size.

•

Relays Contact Stands 1,000-Amp. Impulse Current

A NEW specially designed relay for firing speed flash lamps has been announced by Potter & Brumfield Sales



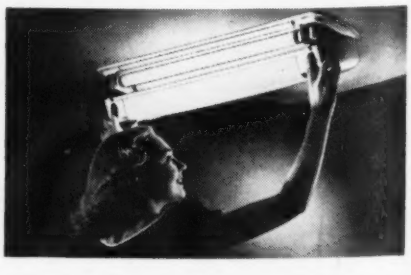
Co., 549 West Washington Blvd., Chicago 6, Ill. It is designed to discharge a high condenser bank into the bulbs. A new contact material is said to be employed which will withstand 1,000-amp. impulse current.

The relays are reported insulated for 3,000 volts breakdown. They are silicon varnish impregnated. Silicon steel is used in the core, frame and full-floating, locked armature to reduce residual magnetism. They are made in all contact combinations up to double-pole, double-throw for both a.c. and d.c. operation.

•

Fluorescent Fixture Design Facilitates Cleaning

A NEW FLUORESCENT UNIT designed to facilitate cleaning and relamping operations is being introduced by Neo-Ray Products, Inc., 313 East 22nd St., New York, N. Y. Known as the Luminette 906, it opens as catches are released



PUTT WITH A DRIVER? NO!

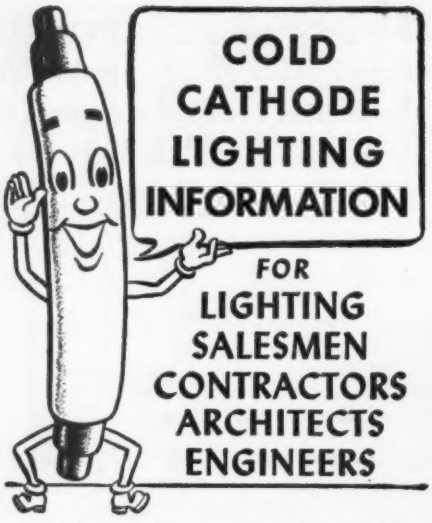
When you're on the green, a putter and putting stance are "essentials" for holing out . . . and experience is equally essential for consistent results. In the creation of essential papers for industry, MOSINEE paper technicians concern themselves with the job you want paper to perform for your product . . . and the technique of your processing. Through years of successful experience in controls of maximum-minimum pH, uniform specified density, high tensile strength, specified dielectric strength, moisture repellency and other vital paper characteristics, MOSINEE consistently gets results that improve products and processing. That's why many manufacturers rely on MOSINEE as a dependable source for industrial papers.

MOSINEE PAPER MILLS COMPANY

MOSINEE • WISCONSIN

Essential Paper Makers

Please address your letter "Attention Dept. B"



Let this technical data and printed material help you to specify and sell *Better and More Dependable* lighting installations.

For commercial or industrial installations

***COLOVOLT**

Cold Cathode Low Voltage Lighting offers these extra advantages

- Longer lamp life... one year guaranteed
- Lower maintenance cost per foot candle of light
- Minimum interruption of important production jobs
- Instantaneous starting without troublesome starters
- Engineered for individual or line lighting

Write for Illustrated Material and Technical Data today!

SEE OUR CATALOG IN SWEET'S

Architectural and Engineering Files for 1947

***Trade Mark Registered U.S. Pat. Off.**

GENERAL LUMINESCENT CORP.

660 S. FEDERAL STREET • CHICAGO 5, ILLINOIS

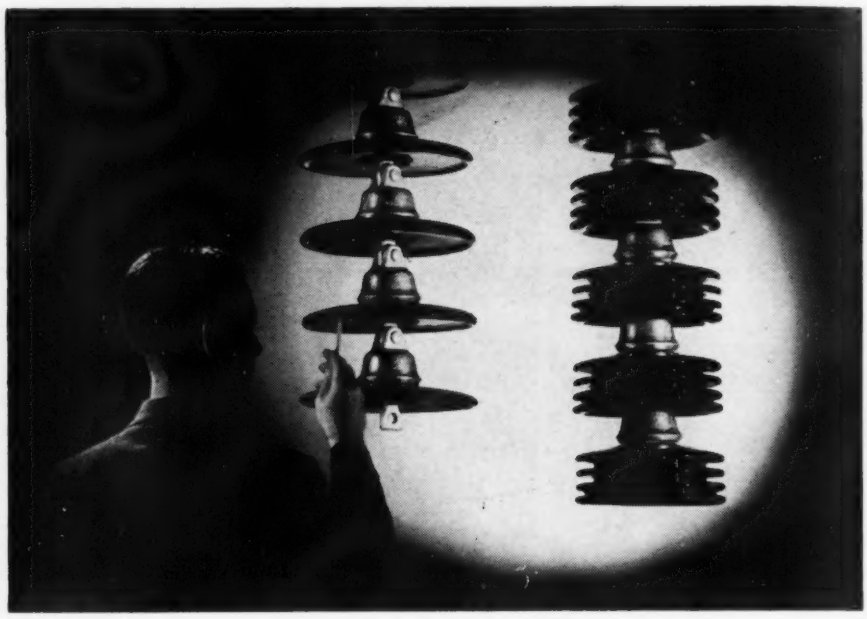
by finger pressure on the two end buttons.

The body and reflector are finished with a bright, baked white enamel that is stated to be heat-resistant. The shield is plastic and has a satin-silver finish. The butt-on socket is mounted on a rigid steel support.

The fixture accommodates four 20-watt fluorescent lamps and can be operated on 110-125 volt, 60-cycle or 220-250 volt, 50-cycle circuits.

• • •

Insulators Developed for Fog and Contaminated Areas



TWO NEW suspension insulators, for use in localities where fog and contaminated atmospheric conditions exist, are being introduced by Locke Insulator Corp., Baltimore, Md. No. 18212 is shown at the left and No. 18226 at the right.

No. 18212 is recommended by the company for use where driving, washing rains or wind storms are prevalent. It has a single, smooth-surfaced shell which is said to be cleaned by wind or rain and to simplify manual cleaning. Probability of flashover due to dripping is said to be minimized since the shells do not rest closely one above the other in the string. The 12-in. discs are reported to provide adequate arcing distance around the shell. Hot line tools may be used on the units.

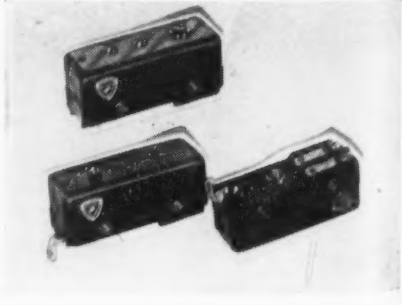
No. 18226 is recommended where driving, washing rains and winds are not frequent. The total leakage distance around the shell is reported as 18 in.; tube diameter as 10 in. The shell diameter of the latter is said to provide more clear arcing distance between the bottom of the shell and the cap of the next lower unit than is the case with 18212. It is also reported to have greater vertical drip distance between shells. A vertical skirt inside the shell provides additional protected leakage distance, the company reports.

• • •

Precision Switch Has "Maintained-Contact"

TWO NEW "maintained-contact" style switches are announced by Unimax Switch Corp., 460 West 34th St., New York 1, N. Y. They are designed for services requiring the compactness and accuracy of a precision, snap-action switch combined with a latch-out or latch-in feature whereby the circuit established by momentary force application is maintained until restoring force is provided.

For use where initiating and restoring force are applied in the same direction, style "O" Unimax has both operative and reset buttons extending through the switch cover. When operating forces travel in opposite directions, the rec-



UNITED STATES RUBBER COMPANY

SERVING THROUGH SCIENCE

Some people are just different!

And the same goes for electrical wire. Laytex (Type RU) branch circuit wire stands out from the mob because it is the world's smallest diameter, lightest weight natural rubber-covered building wire.

The small diameter of Laytex permits more circuits per conduit. The 90% unmilled, grainless natural rubber insulation is applied in laminated walls that form an electrically safe sheath. The conductors are perfectly centered, eliminating chances of thin spots. Dielectric and tensile strengths are high.

Laytex (Type RU) is more than just different. In physical and electrical qualities, there is no other wire to compare with it.

UNITED STATES RUBBER COMPANY
1230 Avenue of the Americas • Rockefeller Center • New York 20, N. Y.

SAFETY FACTORS THAT PUT RU OUT IN FRONT

BULL'S EYE
The conductor is on dead center throughout every inch of the wire.

ELEPHANT INSULATION
Laminated walls of natural rubber insulation mean Laytex (RU) is safe.

SMALLER O.D.
Allows more circuits per conduit than in ordinary wire. Lighter weight.

Specify RU **Laytex**

ELECTRICAL WIRES AND CABLES

Look to Locke for
Distribution Materials...
Guy Clamps
for instance...
This is the Locke No. 6461 heavy-duty guy clamp—for strand sizes 5/16-inch to 1/2-inch. It is one of a complete line of Locke guy clamps.
Holes line up accurately for easy installation. The ends of the grooves are rounded to prevent damage to the strand. Carbon steel bolts develop full holding power—the threads will not strip. And, of course, it has *Permazinc*—Locke's *Quality Controlled* double hot-dip galvanizing —for extra years of dependable performance.
Complete lines of distribution materials are maintained in six Locke regional warehouses and in most distributors' stocks.
Depend on Locke for *Quality Controlled* distribution materials—pole line hardware and insulators. *One* order covers *both*.
Locke
POLE LINE HARDWARE *and* INSULATORS
LOCKE INSULATOR CORPORATION • BALTIMORE 3, MARYLAND

ommended Unimax is style "U", having its reset button extending through the base of the switch. The latter style can be equipped with standard Adaptaplates carrying various actuating members to facilitate utilization of the switch in diversified apparatus designs.

These new Unimax styles carry ratings of 15 amp. 125 volts, 5 amp. 250 volts, and ½ hp. 115-460 volts; all ratings are 60 cycle a.c. Style "O" is for spst service and style "U" is for spdt service.

•

Screw-in Swivel Socket Has Shade Attached

A NEW LINE of adjustable screw-in lighting units for use in stores and store windows, theaters, homes, etc., is being announced by Swivelier Co., Inc., 32 Irving Place, New York 3, N. Y. The hooded shades will accommodate up to a 300-watt type R40 bulb or PAR-38 spotlight or floodlight bulb.

In addition to the standard screw-in type, they are available with screw-in extension pipes in 5, 8 and 11-in. lengths. All units utilize the company's standard Swivelier socket. The hood is infra-baked aluminum finished and has an outside diameter at the hood opening of 6 in.

•

Mercury Switch Breaks Arc in Hydrogen

MERCURY SWITCHES in 5, 10, 15, and 20-amp. capacities for hazardous areas have been developed by Mercontrol

Inc., 278 Pearl St., New York 7, N. Y. The units are hermetically sealed and contain hydrogen under 28-psi. pressure. They are designed to operate on 110- and 220-volt, a.c. or d.c. circuits and are reported to stand overloads of 400 percent for short periods.

The switches are 1½ in. long and ½ in. in diameter and may be installed in standard cartridge-fuse holders.

NEWS ABOUT PEOPLE

Ewart New Chief Mechanical Engineer, Buffalo Niagara

Appointment of J. Norton Ewart as chief mechanical engineer of Buffalo Niagara Electric Corp., Buffalo, N. Y., has been announced. Mr. Ewart, who has been superintendent of production

J. N. EWART

for the company, succeeds C. C. Whelchel, who is resigning to join a utility in California in August.

As a result of Mr. Ewart's promotion, two other appointments involving the management of C. R. Huntley steam stations were announced. Franklin S. Helfter, who has been assistant superintendent of the Huntley stations, becomes superintendent, and William G. Godfrey, assistant to the superintendent of Huntley, becomes assistant superintendent.

Mr. Ewart has been associated with the Buffalo utility since 1929 when he started as an assistant field engineer. He has served as assistant superintendent and superintendent of the Huntley stations. In his capacity as a field engineer, Mr. Ewart had much to do with the erection of the 75,000 kw. and the 160,000-kw. additions to the steam-electric generating facilities at Huntley. In 1939 he succeeded the late D. H. Scranton as superintendent of the stations, and in 1945 he was named superintendent of production for the company.

Mr. Helfter became identified with the company in 1923 and Mr. Godfrey in 1929.

Mr. Whelchel has been with the company since 1939 when he started as assistant chief mechanical engineer, becoming chief mechanical engineer two years later.

•

P. U. A. A. Elects Metcalfe President for 1947-48

Harold S. Metcalfe, who was elected president of the Public Utilities Advertising Association at the recent convention in Detroit, (ELECTRICAL WORLD, June 28, page 5), is widely known in the electrical industry, in advertising and in the field of public relations.

A graduate of Ohio Wesleyan Uni-

H. S. METCALFE

versity, Mr. Metcalfe has been connected with West Penn Power for more than 20 years and at present occupies the position of advertising manager.

For 13 years he served as chairman of the advertising committee of the Pennsylvania Electric Association and, at present, is chairman of the Business Development Section of that association.

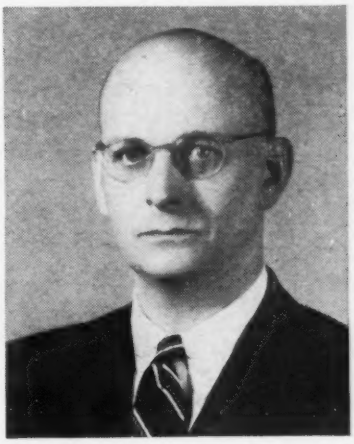
•

▶ MERRILL E. SKINNER, director of sales, Union Electric Co., St. Louis, was elected recently to the board of directors of the Missouri State Chamber of Commerce.

▶ HENRY I. NICHOLL, assistant superintendent of the Regina, Sask., Canada Light and Power Department, has been named superintendent to succeed S. G. Dethridge who retired recently.

Allis-Chalmers Organizes Turbo-Power Department

Formation of a new turbo-power development department in the engineering development division of the Allis-



R. C. ALLEN

Chalmers Manufacturing Co. has been announced by W. C. Johnson, executive vice-president of the company's general machinery division.

R. C. Allen, one of the country's lead-

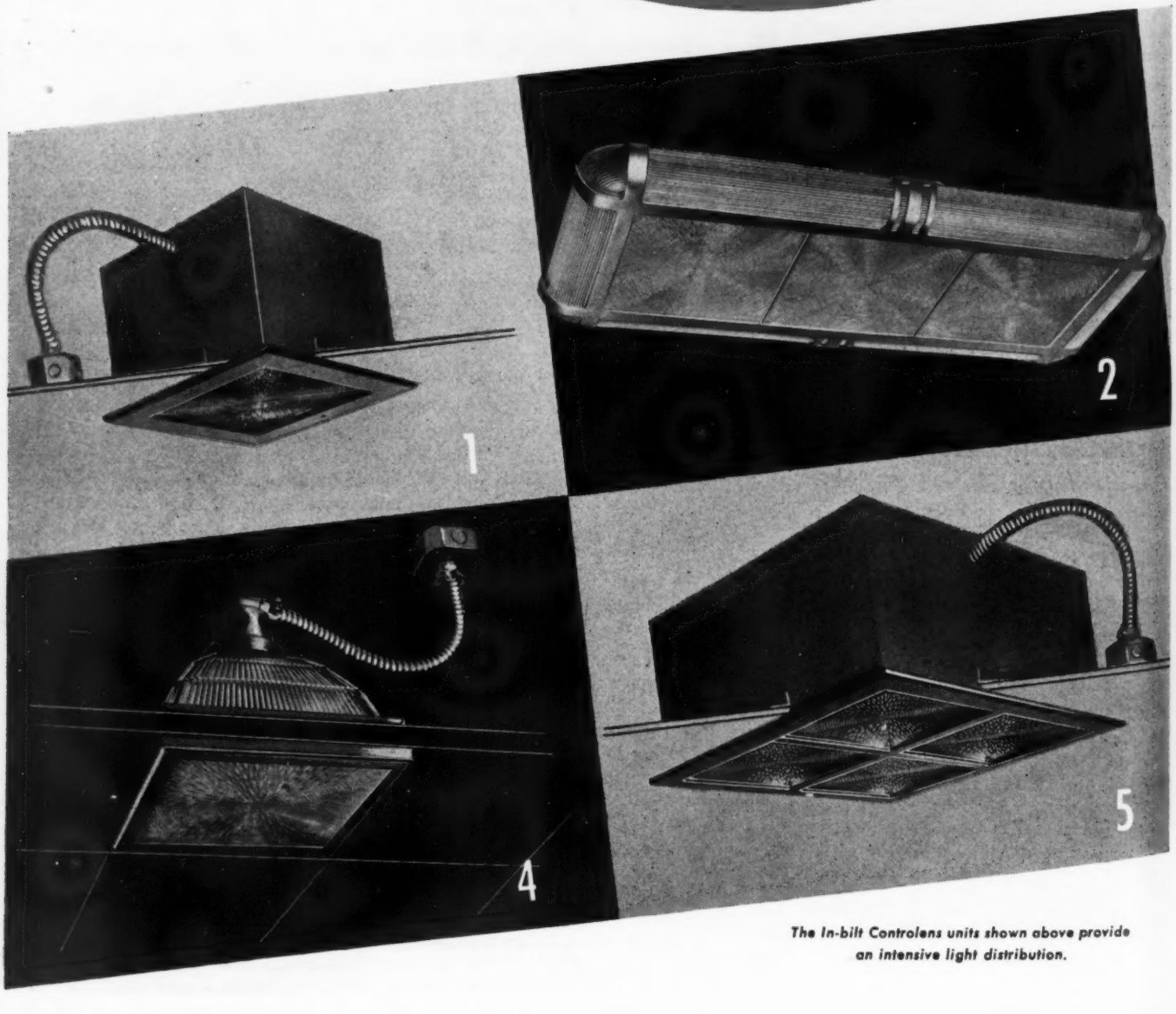
W. A. YOST

ing turbine engineers and former head of the A-C steam turbine department, has been named manager and chief engineer of the new department. W. A. Yost, formerly assistant manager, succeeds Mr. Allen as manager of the steam turbine department.

Recognition of the growing importance of many current engineering proj-

HOLOPHANE

IN-BILT



The In-bilt Controlens units shown above provide an intensive light distribution.

1 **Single flush unit.** Square-lens-square-reflector (basic optics for all except #6.) 12" or 8½" square lenses contained in metal housing for any building construction.

2 **Decorative drop-trim units.** Single and multiple types. Ceiling illumination through ribbed glass side panels. 12" lenses. May be alternately equipped for accent lighting.

3 **No-Box type,** modification of #1. Single flush units. Square-lens-square-reflector with 12" or 8½" square lenses. Affords substantial savings in fire-resistant buildings.

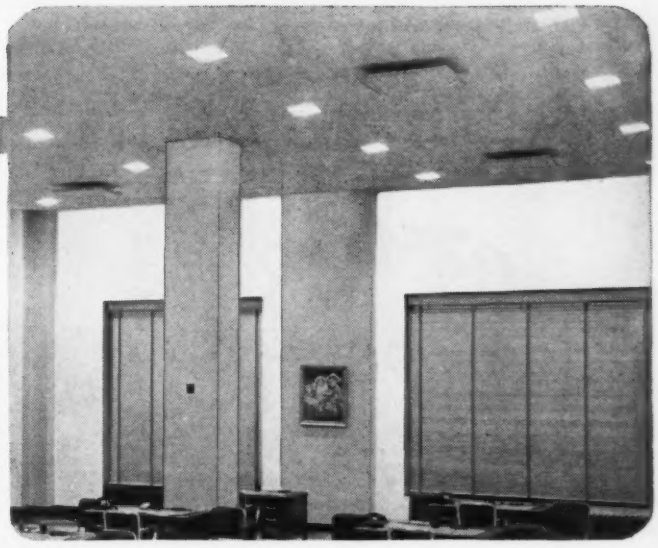
4 **For acoustical tile ceilings.** Modification of #3. Flush units, single or multiple types. 11" square lens.

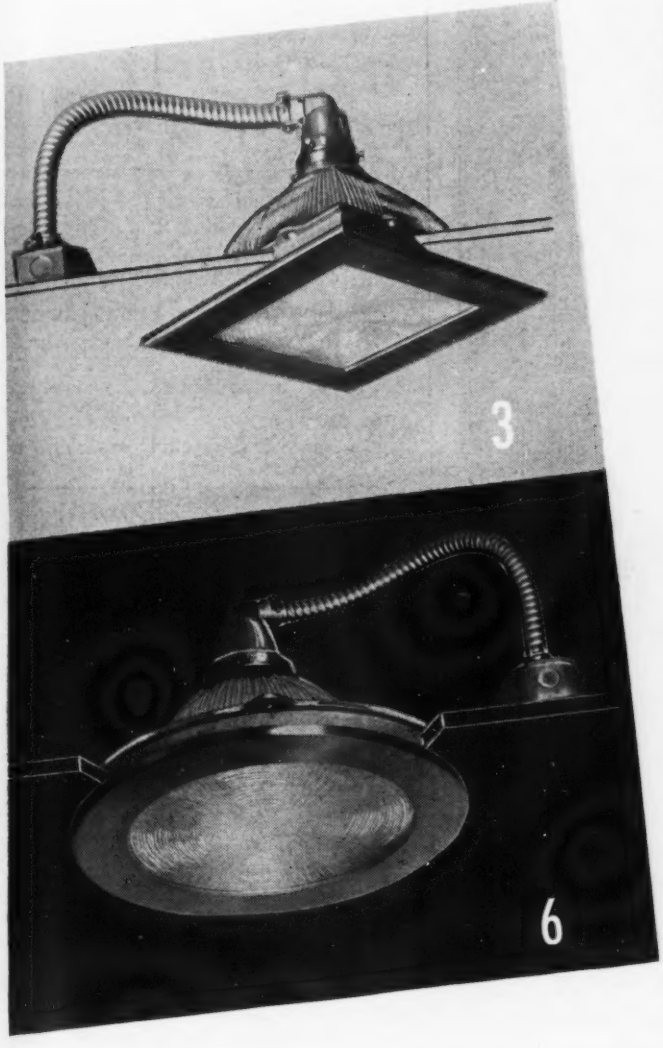
5 **Multiple flush units** (four-square as above and 2 or more in-line). Lenses and reflectors are 12" square. In metal housing.

6 **Flush unit No-Box type.** Round-reflector-round-lens, 13½" diameter. Employ where round shape is architecturally indicated.

PRODUCTS OF HOLOPHANE RESEARCH

INCANDESCENT

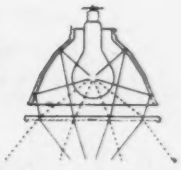




This matched "Optical-Train" meets over 85% of today's IN-BILT lighting requirements

For general lighting applications, where it is desirable to secure uniform illumination from regular grid spacings up to 1¼ times the mounting height, Holophane offers the exclusive double-action Controlenses. On superficial examination they may resemble other lens types, however their performance for general lighting purposes is far superior.

Observe from the sketch their ability to accept light rays, at the same point on the lens that approach from equally opposite directions, and then to diverge them in an equally opposite amount.



The ultimate refinement resides in the matching of forms: square prismatic reflectors with square prismatic lenses; round reflectors with round lenses. This results in uniform brightness over the entire surface of the lighted unit.

Consider these cumulative advantages from the use of Holophane IN-BILT Controlens Systems: **A.** highest illumination values from any built-in system . . . **B.** crystal prismatic glass transmits the light unmodified and undistorted . . . **C.** glass control surfaces impervious to chemical change; ordinary washing solutions restore them to initial efficiency . . . **D.** low cost per-footcandle-per-year because of better maintenance due to enclosed construction . . . **E.** artificial lighting in the natural manner; this method comes nearest to letting in the sky . . . **F.** last word in the art of lighting; interiors appear clean, orderly, spacious.

Consult Holophane Engineering Service

The family of Holophane In-Bilt Controlens units is more extensive than space permits us to show and describe here. Actually, the combination of optical arrangements and lighting effects which can be secured with prismatic Controlens systems are nearly inexhaustible . . . Engineering data is available from which you can design the average job. If your lighting project requires a technique which is not readily apparent, the services of our Engineering Department are at your disposal.

Holophane
Trade Mark

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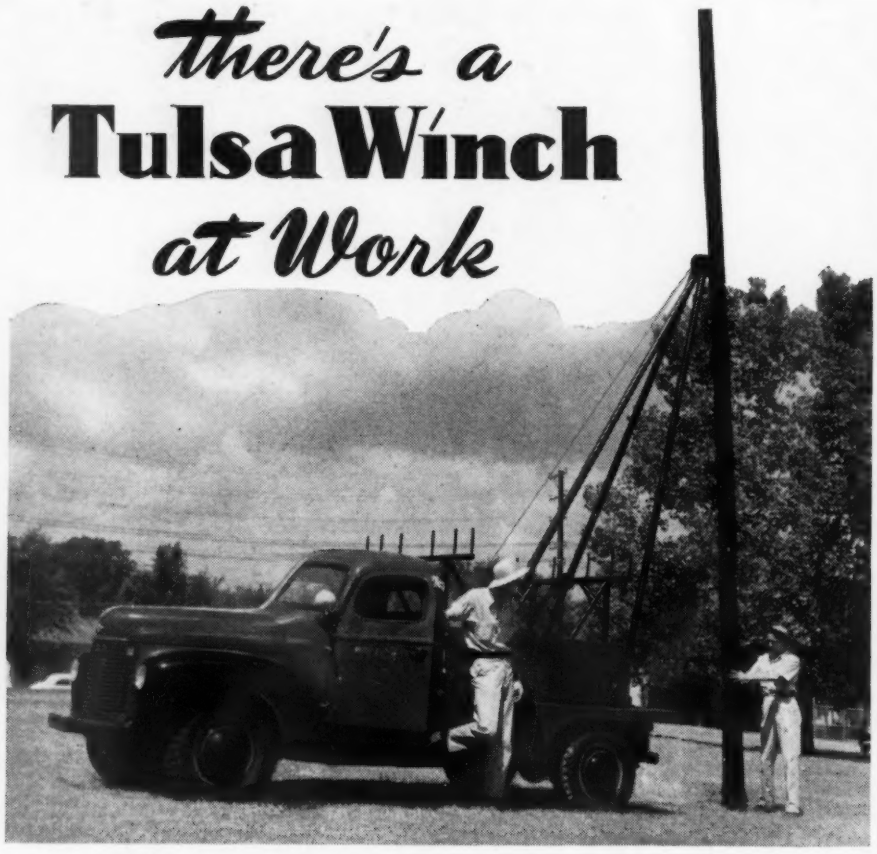
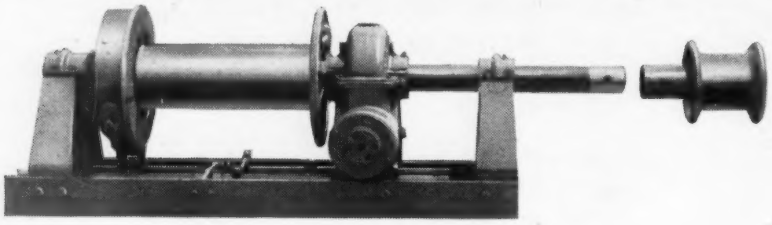
Lighting Authorities Since 1898 • 342 MADISON AVENUE, NEW YORK 17, N. Y.

THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

there's a
Tulsa Winch
at Work





Tulsa Winch with Extended Drum Shaft
for Public Utility Companies
(Note Detachable Cathead and Adapter)

"We Wouldn't Think of Sending Out A Crew Without a Winch Truck . . ."

Such was the comment of one public utility engineer . . . and the winches on the majority of those trucks are TULSA WINCHES. The Tulsa Winch is made in standard, as well as the special utility winch illustrated. The Tulsa Winch has proved invaluable for all the lifting, pulling and reeling jobs in electrical work. This winch is built to your requirements.

A complete line of winches for all trucks,
½-ton to 8-ton and larger.

Write for Literature and further information. Dept. E 122.

Tulsa Winch
TULSA, OKLAHOMA DIVISION OF VICKERS Inc.

ects in the gas turbine and other turbo-power fields, which have departed from current steam turbine practices, is the basis for creating the new turbo-power development department, according to Mr. Johnson.

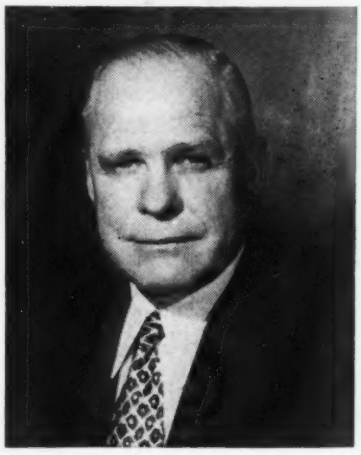
Mr. Allen joined the A-C steam turbine department in 1936, serving subsequently as chief engineer, then assistant manager and manager and chief engineer since 1943. For four years he was a member of the National Advisory Committee for Aeronautics' special committee on jet propulsion. He holds more than 60 patents and is the author of numerous papers on steam and gas power machinery.

Assistant manager since 1945, Mr. Yost joined the A-C organization from the Elliott Co. in 1943 to take charge of the company's war-time expansion in marine turbine production. He has been directly in charge of turbine sales.

•

Bracken Elected President of Western Electric Co.

Stanley Bracken, executive vice-president of Western Electric Co., New York, has been elected president to succeed Clarence G. Stoll on his retirement September 30. Mr. Stoll has served as president of the company since 1940 and his retirement brings to a close a distinguished career of more than 44 years in Western Electric.

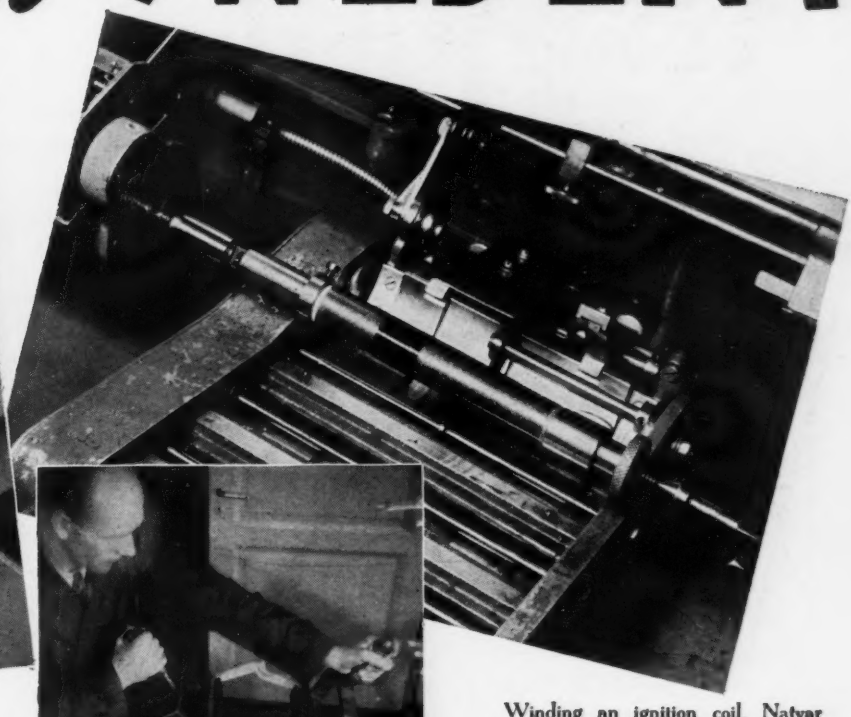


S. BRACKEN

Mr. Bracken brings to his new assignment more than 35 years of experience in the company's manufacturing organization. Immediately after graduation from the University of Nebraska in 1912, he joined the company and was assigned to development engineering, continuing in various branches of this activity until 1922. He then represented the company abroad for three years, returning to Western Electric in 1925. Subsequently he was assigned to the Teletype Corp., a Western Electric subsidiary, resigning the presidency in

NATVAR *in* SWEDEN!

Taping a flat copper strip of magnet wire with Natvar Varnished Fiberglas Tape—a continuous operation.



Winding an ignition coil. Natvar Varnished Paper is used between soft iron core and Bakelite tube.

Rectangular copper conductors, insulated with Natvar Varnished Fiberglas Tape, are wound into coils. They are then formed for installation in locomotive motors.

These pictures were all taken in Swedish shops. Natvar sole representative for Sweden East and North—Hjalmar Andren & Soner, Telegramaddress "PRESSPAN," Kaptensgatan 6, Stockholm. Natvar sole representative for Sweden West and South—Handels-och Fabriksbolaget Hjalmar Andren, Telegramaddress "HJALMANO," Magasinsgatan 3, Gothenburg.

For important jobs, large or small, Natvar insulating materials are used because in actual service they consistently equal or exceed specifications.

If your requirements call for insulating materials with good physical and electrical performance characteristics and exceptional uniformity—it will pay you to use Natvar. Get in touch with your Natvar distributor, or with us direct.

Natvar

Natvar Products

- Varnished cambric—straight cut and bias
- Varnished cable tape
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- Varnished tubings and sleevings
- Varnished identification markers
- Lacquered tubings and sleevings
- Extruded vinyl tubing
- Extruded vinyl identification markers

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THE NATIONAL VARNISHED PRODUCTS Corporation

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221 RANDOLPH AVENUE ★ WOODBRIDGE NEW JERSEY

For Dependable Soldered Connections

Sherman Soldering Lugs are clean, bright, and free from grease, inside and out. To prepare them for soldering, Sherman Lugs are tumbled in sawdust, given a special acid cleaning bath (bright finish) and then rigidly inspected. You get a perfect solder joint every time when you use these lugs. That's why it pays to specify Sherman!

Also:

Solderless Lugs • Splicing Sleeves • Split Bolt Connectors • Wedge Grip Connectors • Ground Clamps and Fittings • Armor Rod Clamps • Jumper Clamps

H. B. SHERMAN MFG. CO.
Battle Creek, Michigan

WRITE FOR *Sherman* CATALOG!

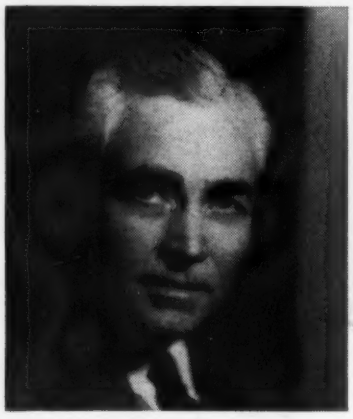
1941 to become general manager of manufacture of the Western Electric Co. He was elected vice-president in 1942 and executive vice-president last month.

•

Gentzel Made Coordinator of Employee Relations

Paul M. Gentzel has been appointed to the newly created position of coordinator of employee relations of the Ohio Public Service Co., Cleveland.

President R. E. Burger, in announcing the appointment, stated that the new office was created to effect a closer relationship between the employees of the operating departments and the supervisory forces. Mr. Gentzel will have the responsibility of adjusting all differences and will endeavor to serve as a mediator wherever the need for such service develops. He will also be in charge of the Junior Engineers Training School, the safety program of the company and will work with the advancement committee.



P. M. GENTZEL

Mr. Gentzel started with OPS in 1920 and since that time has held various engineering positions in Toledo, Massillon and Elyria.

•

► SID GILBERT has been placed in charge of all new motor and control equipment sales for the Electric Equipment Co., Rochester, N. Y., and WARREN A. HAFNER is in charge of rebuilding operation for the company.

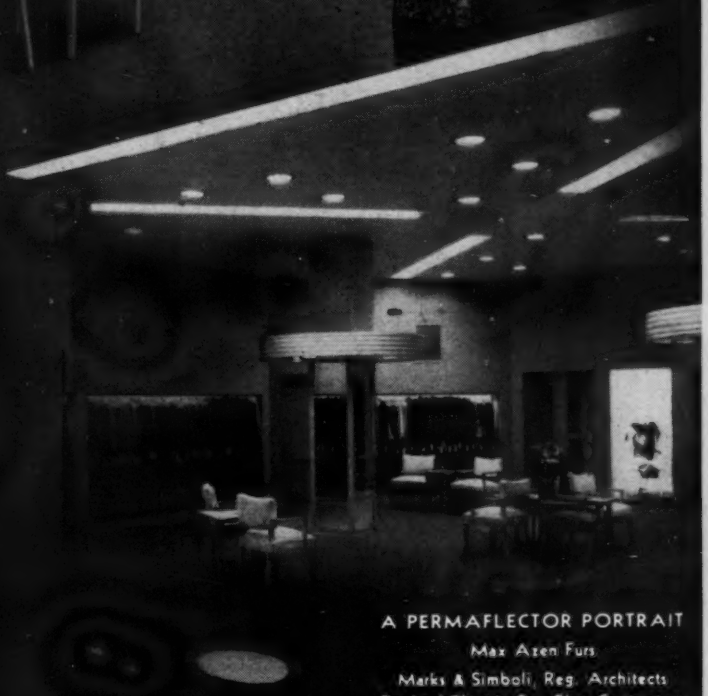
► A. C. MESSER is the new superintendent of power for the Salt River Valley Water Users Association. Formerly assistant personnel director and safety director, Mr. Messer succeeds F. L. ROE, who has been transferred to the newly created position of chief engineer. As superintendent of power, Mr. Messer is in charge of all power plants, transmission and distribution

Custom Lighting Results

Pittsburgh Permaflector Fluorescent and Incandescent Units are going into more and more of America's outstanding stores, offices and buildings.

That is because these standard units produce custom lighting results— and offer the added advantages of high efficiency, easy installation and minimum maintenance.

Why not check this superior equipment before planning your next lighting installation?



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BRONZE
BOLTS

Extra strength ... resistance to corrosion ... resistance to season cracking ... these are some of the qualities of Harper Silicon bronze fastenings which have led to their use by scores of power companies and electrical equipment manufacturers. These fastenings go into sub station assemblies, pot heads, pole line hardware, grounding equipment, and a host of other applications.

5200 ITEMS IN STOCK

Harper maintains a large and widely assorted stock of Silicon bronze bolts, nuts, screws, washers, and rivets. Moreover, similar stocks are maintained in brass, naval bronze, copper, Monel and stainless steel. Ask for summarized catalog.

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Harper engineers specialize in the manufacture and use of non-ferrous and stainless fastenings. Submit your fastening problems to them.

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lines. He served as assistant superintendent of operations when he went to Phoenix. Mr. Messer was previously identified with the Public Service Co. of Indiana in Indianapolis.

•

Reliable Electric Co. Makes Two Additions to Staff

Announcement has been made by the Reliable Electric Co. that W. A. Dinsmore and J. P. Kraft have been added

W. A. DINSMORE

to its staff with headquarters at the factory in Chicago, Ill.

Mr. Dinsmore's assignment covers electric light and power companies and the independent telephone industry

J. P. KRAFT

as far west as Denver, Colo., north to the Canadian line and as far south as Memphis, Tenn.

Mr. Kraft will cover the east central section, traveling as far as Pittsburgh, Pa., to the east; north including Wisconsin and Michigan, and the northern part of Ohio; south as far as central Illinois; west as far as Davenport, Iowa.

Both Mr. Dinsmore and Mr. Kraft have spent more than a year with Reliable. Before entering military service, Mr. Dinsmore was connected with the

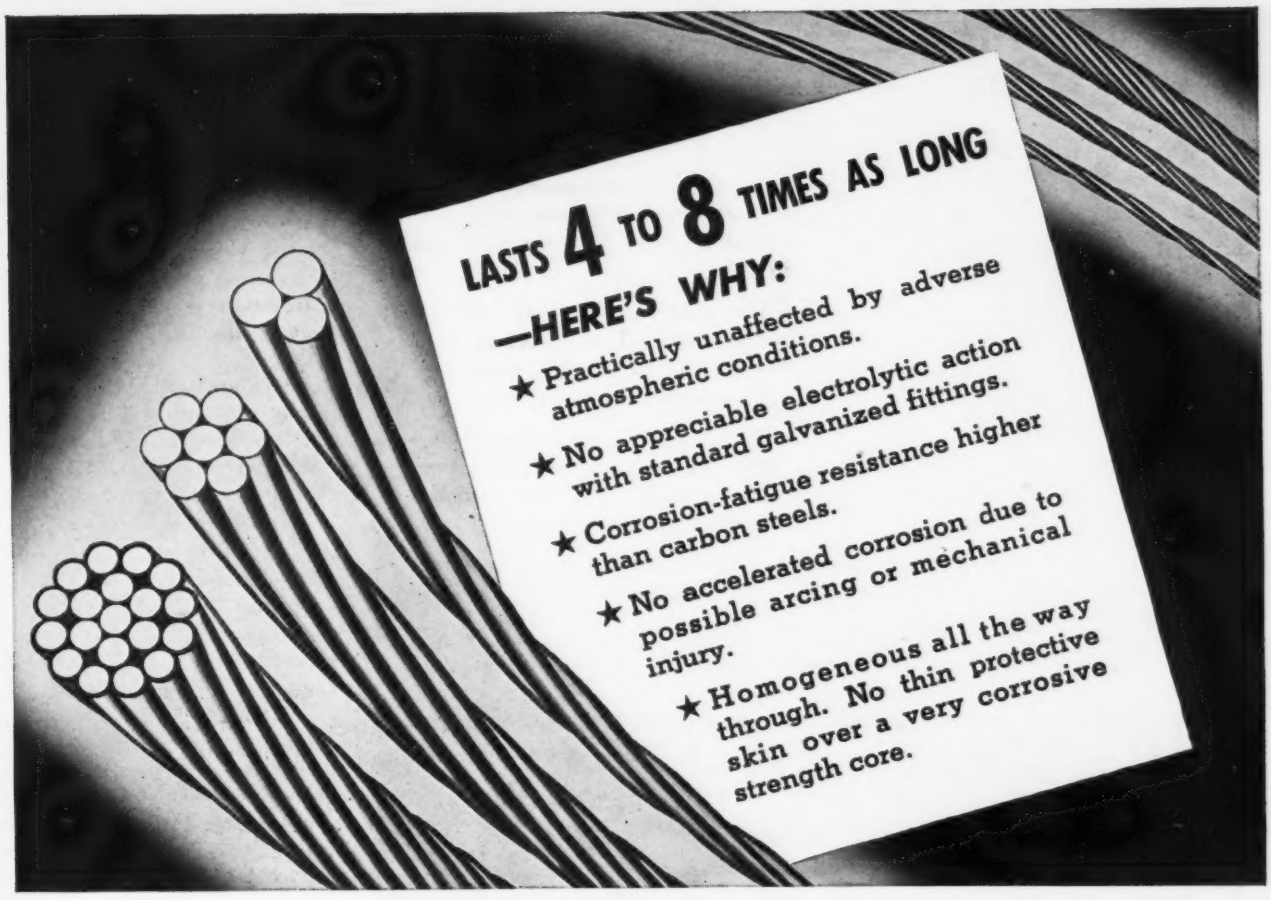
HOW TO MAKE POLES LAST LONGER

Just off the press. A factual booklet describing 12 years field experience with OSMOPLASTIC in ground line treatment of standing poles as well as other timbers. Explains the Osmoplastic method of treatment in detail. Write for your copy.

OSMOSE WOOD PRESERVING CO. OF AMERICA, INC. 1437 BAILEY AVE., BUFFALO 12, NEW YORK

PAGE *Stainless Steel* STRAND

for Ground Wire, Guy or Messenger Wire


LASTS 4 TO 8 TIMES AS LONG
—HERE'S WHY:
★ Practically unaffected by adverse atmospheric conditions.
★ No appreciable electrolytic action with standard galvanized fittings.
★ Corrosion-fatigue resistance higher than carbon steels.
★ No accelerated corrosion due to possible arcing or mechanical injury.
★ Homogeneous all the way through. No thin protective skin over a very corrosive strength core.

. . . after 1966—What?

If an installation of galvanized messenger, guy or overhead ground wire would have to be replaced for strand failure at the end of twenty years, it would be sound economy to install Page Stainless Steel Strand — even if it cost 4 times as much (which it does not).

If, due to corrosion from acid or salt air or erosion due to blown sand, replacement would be necessary in ten years — you could pay 8 times as much for Page Stainless Steel Strand and come out ahead.

Send for the folder that gives you complete information.

ACCO

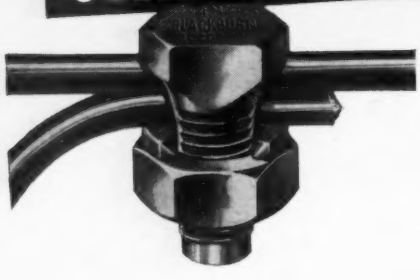
TRADE MARK

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

It Costs Less to Use

BLACKBURN *Hi-Strength* CONNECTORS --BECAUSE:



★ OVER 100 CONVENIENTLY-LOCATED JOBBERS' STOCKS

—They are trouble-free on the line, due to their high-strength construction of DURONZE.

—They produce a more efficient connection. The conductivity of the connection is better than the solid wire itself.

—They last longer. They will not season crack. That's because they are made of DURONZE, more non-corrosive than pure copper.

—They can be re-used over and over again. They will not twist or distort when tightened up. They are the strongest connector made!

BUILDERS OF QUALITY CONNECTORS FOR OVER 10 YEARS

JASPER BLACKBURN PRODUCTS CORP.

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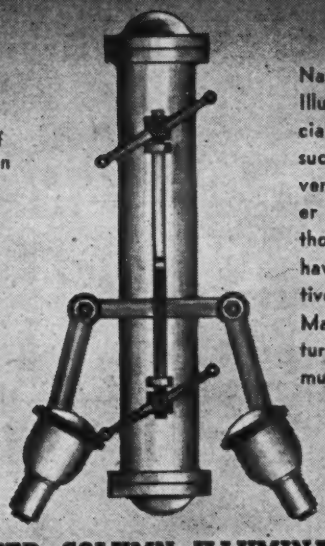
Embodying the Basic Features of meniscus reflection by Controlled Illumination



National Water Column Illuminators are highly specialized products. They successfully meet the severe requirements of power station work, and thousands of applications have proved their effectiveness and reliability. Made by the manufacturers of National Communication Equipment.

WATER COLUMN ILLUMINATORS

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NATIONAL COMPANY, INC.

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MANUFACTURERS OF NATIONAL COMMUNICATION EQUIPMENT

Teletype Corp., Chicago, in the merchandising department. Mr. Kraft spent several years in Naval aviation before being inducted for active duty in the last war. He was formerly connected with the Cleveland Heater Co. in the Chicago area.

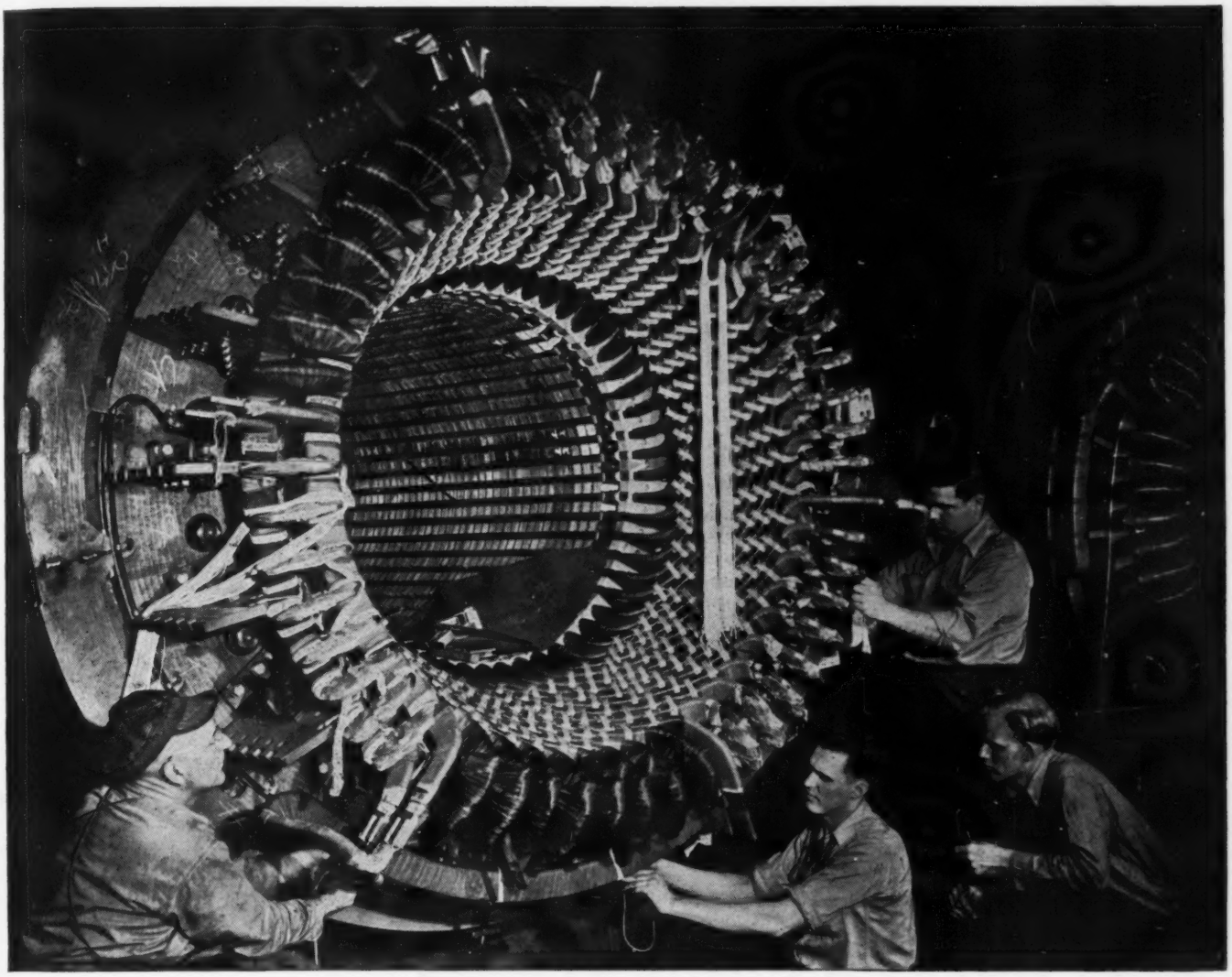
•

▶ J. V. B. DUER, assistant to vice-president-operation of the Pennsylvania Railroad and a pioneer in the application of electricity to railroading, has retired. He is 65 years of age and has 41 years of railroad service. Throughout his career Mr. Duer has been closely associated with the various electrification projects of the Pennsylvania Railroad System. He played a particularly prominent part in supervising the electrification of the railroad's eastern seaboard lines between New York, Philadelphia, Baltimore, Washington and Harrisburg. In 1935 Mr. Duer was appointed to the position of chief electrical engineer of the Pennsylvania Railroad System and in 1941 was promoted to his present position.

▶ TOM ETHRIDGE, who has been active in publicity, sales research and photography for the Mississippi Power & Light Co., Jackson, and editor of the company house organ, the *MPL News*, has been named advertising and sales promotion supervisor. PAUL J. MOONEY, associate editor for the *MPL News* since last year, will succeed Mr. Ethridge as editor. OLIN C. TAYLOR, JR., who has been active in sales and promotional work for the company, has been named industrial representative with responsibility for securing new industries for the company's territory in west Mississippi, and directing research pertaining to the resources of the company's territory.

▶ D. W. TYRRELL, vice-president and general manager of the Ray-O-Vac Co., Madison, Wis., has been elected president of the company. He succeeds W. W. CARGILL, who becomes chairman of the board of directors. Mr. Tyrrell started with the company as a laboratory assistant in 1920. For twelve years he served as president of the Blake Manufacturing Corp., a Ray-O-Vac subsidiary in Clinton, Mass. Mr. Cargill has been with the Ray-O-Vac for 27 years.

▶ DAVID C. PETERSON, formerly industrial consultant, has been appointed director of engineering and research at the main Chicago plant of Stewart-Warner Corp., Chicago. Before joining Stewart-Warner, Mr. Peterson was actively engaged for six years as an industrial consultant to several large



For new equipment or rewinds insist on Fiberglas* insulation

Here's a sure way to get more value for less money, whether you are concerned with new electrical equipment or with the maintenance of equipment in use.

Fiberglas-base Electrical Insulating Materials have the unique combination of characteristics that enables them to withstand conditions that cause failures when other materials are used.

For example, a recent survey shows that, on the average, motors rewound with Fiberglas-base materials last six times longer. The cost of Fiberglas materials required to provide this length of service is 67% less than that of the class "A" materials that would be needed to give the same length of service.

Fiberglas Electrical Insulating Materials are made in forms to meet practically every insulation need. Ask your distributor for complete information or write: Owens-Corning Fiberglas Corporation, Dept. 858, Toledo 1, Ohio.

Branches in principal cities.
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*FIBERGLAS is the trade name (Reg. U. S. Pat. Off.) of a variety of products made of or with glass fibers by Owens-Corning Fiberglas Corporation.

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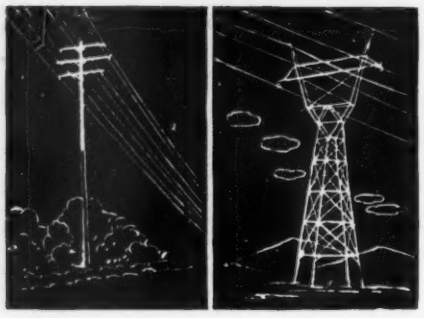
ELECTRICAL INSULATING MATERIALS

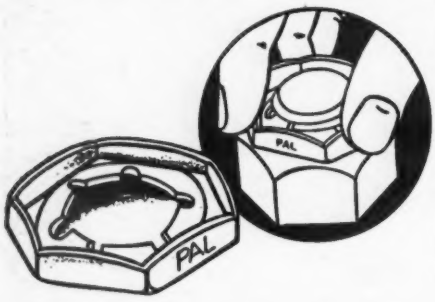
TAPES • CLOTHS • BRAIDED SLEEVING • VARNISHED TUBING • MICA COMBINATIONS • LAMINATES

ELIMINATE RE-TIGHTENING OF NUTS

On Steel Tower and Wood Pole Lines



Specify "Palnuts" on new lines
Add "Palnuts" to existing lines



For over 10 years, Double Locking "Palnuts" have been keeping bolt-and-nut assemblies tight on steel towers, wood pole lines, cross arms and braces, insulator pins, clevises and clamps.

When applied on new installations, "Palnuts" save future checkups and re-tightening. Maintenance crews checking old installations can add "Palnuts" without disturbing regular nut. Only 3 bolt threads space are required. "Palnuts" are very low in cost; may be removed and reused. They are available in a full range of sizes, in Hot Dipped Galvanized or other finishes and materials used by the Utility industry.

SEND details of your needs for samples. Write for "Palnuts" Manual and detailed folder on power line applications.

THE PALNUT COMPANY
51 Cordier St.
Irvington 11,
New Jersey

Diesel engine manufacturers, working on various phases of engineering and production.

▶ DR REAVIS C. SPROULL, formerly in charge of a research and development group of the General Electric Co., has been added to the staff of the Southern Research Institute, Birmingham.

▶ CHARLES B. KORTEN has been appointed commercial manager of the Cowlitz P. U. D. at Longview, Wash., succeeding W. J. MANDLEY, resigned. Mr. Korten was formerly employed by the P. U. D. as a civil engineer.

▶ EARL R. MCALESTER, formerly lighting sales engineer for Pacific Gas & Electric Co., and subsequently with Westinghouse Electric Supply Co., and Marinship, has joined the staff of the Sacramento Utilities District as lighting sales engineer.

▶ DR. LEO L. BERANEK, formerly director of the Electro-Acoustic and the Systems Research Laboratories of Harvard University, has been made associate professor of communications engineering in the department of electrical engineering at Massachusetts Institute of Technology.

▶ MRS. GERTRUDE M. CROSTHWAIT has been appointed supervisor of home service for the Connecticut Light & Power Co., with headquarters at Waterbury. She joined the sales department at Meriden in 1941 and in 1944 became secretary to the president, C. L. Campbell, with headquarters at Hartford. Besides working closely with home service personnel, Mrs. Crosthwait will cooperate with appliance dealers throughout the company's territory.

▶ F. H. PUMPHREY, formerly engineer of the educational division of the General Electric Co., Schenectady, N. Y., has been appointed head of the electrical engineering department of the University of Florida. In his new position Professor Pumphrey not only will administer the instructional program of the department, but also will supervise the electrical engineering portion of the university's engineering and industrial experiment station work.

▶ SAMUEL S. PHARR has been appointed by the Memphis City Commission as vice-president of the light, gas and water commission to succeed E. BRUCE BYNUM, resigned. Mr. Pharr returned to Memphis last January after serving for a time as chairman of the State Railroad and Utility Commission at Nashville. He has also served with

Announcing

The 1st volume in the long-awaited Massachusetts Institute of Technology
RADIATION LABORATORY SERIES

Bringing you

the engineering data you need to design RADAR SYSTEMS

Here is an important book which presents the general principles of the design of various radar systems. From the standpoint of the designer the book discusses the basic considerations which underlie and are particular to systems design. After a general approach to problems encountered, it takes up the leading design considerations for the important components that make up a radar set. Two new and important auxiliary techniques—moving target indication and the transmission of radar displays to a remote indicator by radio means—are fully treated. Detailed examples of actual systems are included. Anyone interested in the varied applications of radar will find this new volume of immense value as a basic, useful reference.

RADAR SYSTEM ENGINEERING

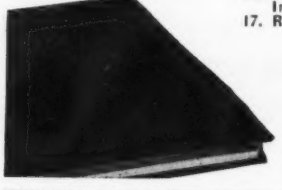
Just Out

Edited by Louis N. Ridenour, Editor-in-Chief, Radiation Laboratory Series; Professor of Physics, University of Pennsylvania, 737 pages, 6 x 9, $7.50.

This is the first of twenty-eight volumes prepared principally by members of the Radiation Laboratory maintained during the war at the Massachusetts Institute of Technology under contract with the National Defense Research Committee of the Office of Scientific Research and Development. The Laboratory was the foremost U.S. research and development institution in the field of microwave radar. The accuracy and usefulness of the material made available in these volumes is attested by their authoritative background.

Contents

1. Introduction
2. The Radar Equation
3. Properties of Radar Targets
4. Limitations of Pulse Radar
5. C W Radar Systems
6. The Gathering and Presentation of Radar Data
7. The Employment of Radar Data
8. Radar Beacons
9. Antennas, Scanners, and Stabilization
10. The Magnetron and the Pulser
11. R. F. Components
12. The Receiving System—Radar Receivers
13. The Receiving System—Indicators
14. Prime Power Supplies for Radar
15. Examples of Radar System Design
16. Moving-target Indication
17. Radar Relay



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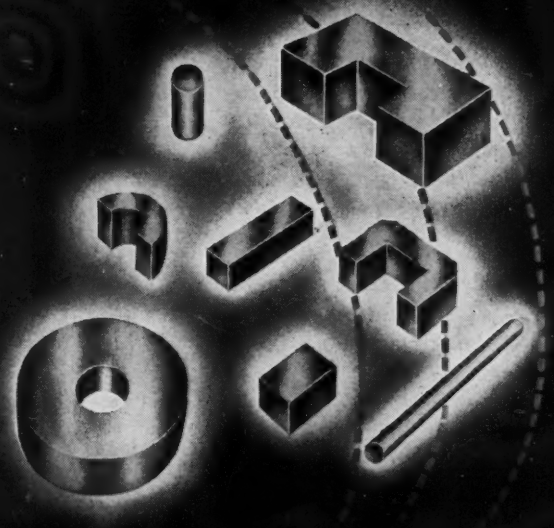

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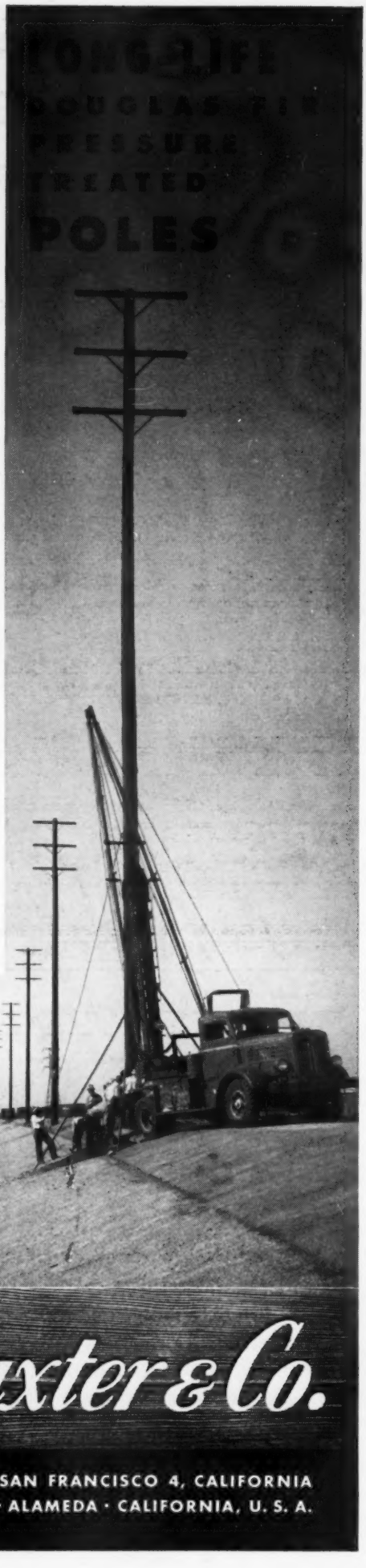

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the research department in the city-county utilities research department at Memphis.

OBITUARY

Clark M. Osterheld

Clark M. Osterheld, vice-president and general manager of the Clark Water Heater Division of the McGraw Elec-

tric Co. of Chicago, died on July 6 in Madison, Wis., after a short illness.

Mr. Osterheld was widely known in the electrical industry as a pioneer, inventor and executive in the electric water heating field. More than 30 years ago he designed and built one of the first successful storage-type electric water heaters. He also made many significant contributions toward the improvement of this major appliance, which are covered by almost a hundred patents.

For a time he owned and operated the plant in Stoughton which manufactured Clark Electric Water Heaters, bearing his name. In 1928 he sold his interests in the Clark heater to the McGraw Electric Co. Ten-years-later, shortly after the factory was moved to Chicago, he joined this company as chief engineer in charge of research and development. In 1945 he was made general manager of the Clark Water Heater Division and last year was made a vice-president, still retaining active control of the research department. Mr. Osterheld was a native of Stoughton, Wis.

•

▶ HARRY A. MAURER, formerly general superintendent, director and secretary of the Oster Manufacturing Co., Cleveland, Ohio, died on June 17 after an illness of several months. He was 70 years old. Associated with the Oster Manufacturing Co. since 1905, he was considered an outstanding authority on advanced shop practices. He had retired from active duty with the com-

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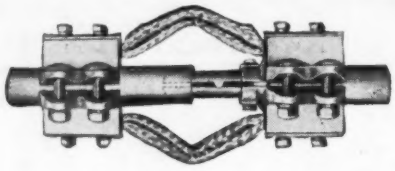

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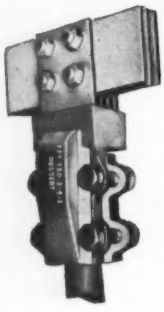

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pany about a year ago, but had acted in a consulting capacity until his illness hospitalized him.

•

Bernard P. Carey

Bernard P. Carey, formerly vice-president-general counsel of the Philadelphia Electric Co., died on July 7 in that city after a long illness. He was 53 years old.

Mr. Carey entered the employ of the

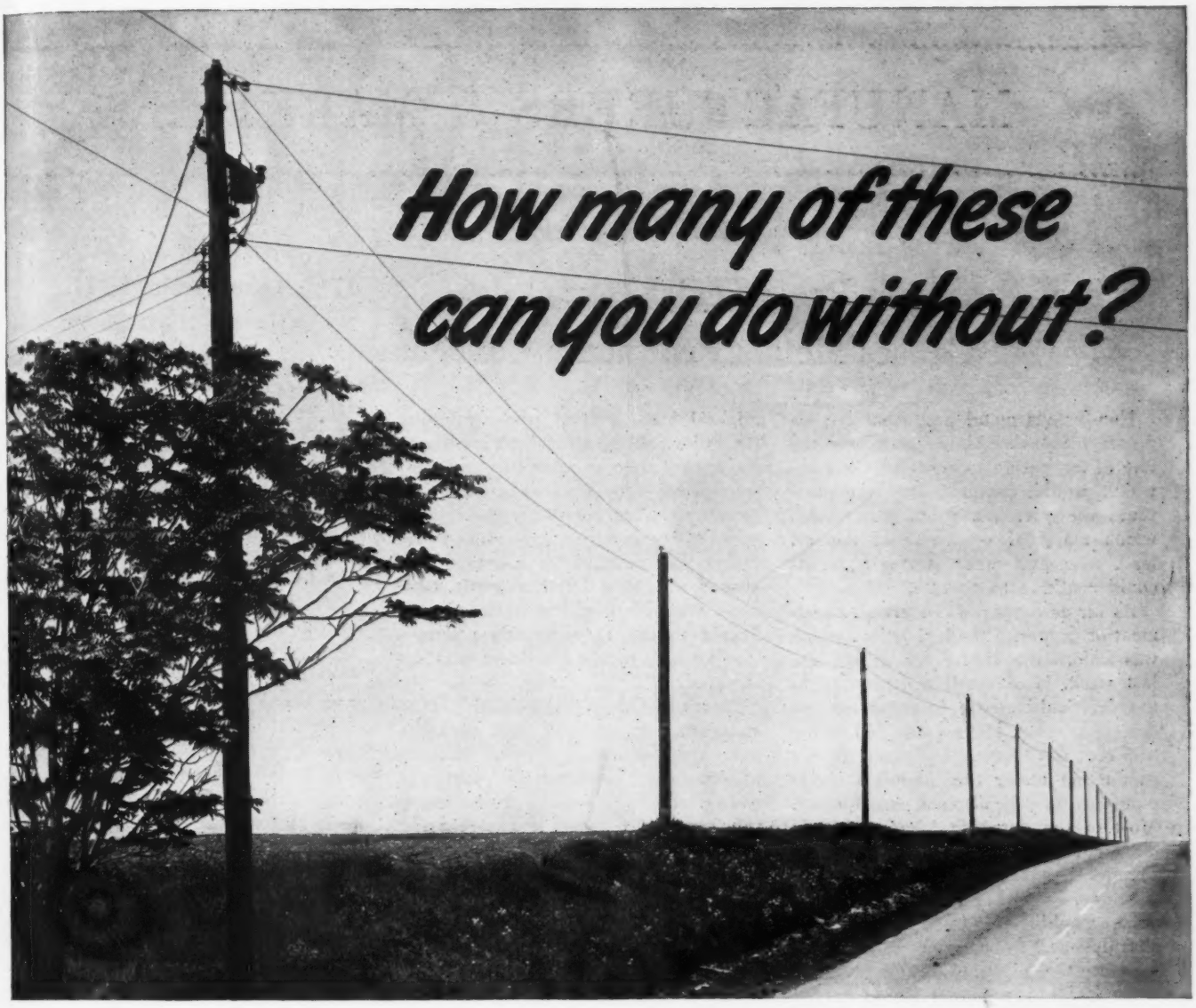
company in 1913, and after a few years he was transferred to the legal department. In 1924, he was named attorney for the company, and counsel in 1928. He continued in that position until 1939, when he was appointed general counsel. In 1943 he was elected a vice-president of the company.

Mr. Carey was a past-president of the Pennsylvania Electric Association and held membership in the American Gas Association and the American, Pennsylvania and Philadelphia Bar Associations.

•

► WALTER BELDING, superintendent of construction for the Central Vermont Public Service Corp., Rutland, died recently in that city. He was graduated in 1911 from the University of Vermont and was formerly employed in operating positions, engineering and executive capacities with predecessors of the Central Vermont company, the Keene (N. H.) Gas & Electric Co., and the Burlington (Vt.) Electric Light Department as manager of the last-named organization. He was secretary of the Vermont State Board of Registration for Professional Engineers.

► CHARLES W. MILLS, formerly treasurer of the Cleveland Electric Illuminating Co., who retired in 1942, died on July 6 at his summer home in Milford, N. H. At the time of his retirement he had completed 50 years of service with the Cleveland utility.



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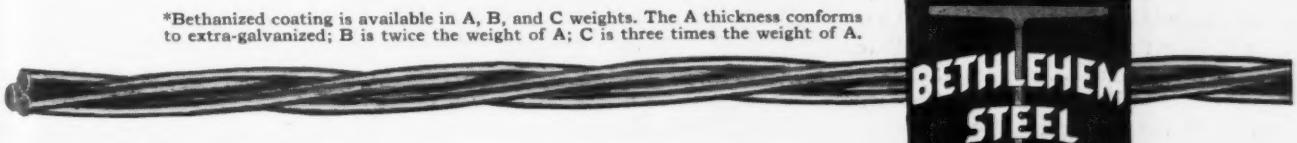
*Bethanized coating is available in A, B, and C weights. The A thickness conforms to extra-galvanized; B is twice the weight of A; C is three times the weight of A.



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MANUFACTURERS & MARKETS

Fate of Premium Price Legislation Causes Metals Producers Concern

Non-ferrous metal producers are expressing considerable concern over the fate of legislation now before Congress which would continue for two more years the premium price plan under which marginal producers of copper, lead, zinc and other strategic metals could continue to operate.

As far as copper is concerned, enactment or failure of the legislation, which was before the House for action late last week, is of small consequence to the electrical industry, informed sources declared. They pointed out that at the 21.5 cent world price, additional copper production under the premium price plan would not be of much consequence. Most of the domestic tonnage, it was declared, can operate nicely without premiums at existing price levels.

They added that the present world price would have to drop off most sharply—perhaps as much as 5.5 cents—before the failure to have a premium price law on the books would curtail domestic output to a point at which the electrical industry would be hurt.

Some added that, if such a price drop were to occur, it would probably result from causes which concurrently would curtail a measurable portion of the electrical industry's demand for copper.

All agreed that the prospects for such a drop in the world copper price are non-existent today.

The pending legislation would continue the premium price plan—not now in effect on copper—for two years, with expenditures for subsidies limited to $35,000,000 yearly.

Primary concern about its fate lay in the ever-shortening period in which the Senate will be able to consider it before the statutory adjournment date two weeks hence. With a legislative log-jam of monumental proportions already harassing the Senate, proponents of the metals-subsidy bill are fearful that they will lose their fight. It was believed that, having finally been reported favorably in the House, it would be approved there without difficulty.

Favoring its chances in the Senate was enthusiastic support by the Western mineral bloc, without whose approval the bill would be dead. At least some Easterners were antagonistic, and there were unsupported rumors in New York last week that the State Department opposed the measure, preferring to see federal expenditures for minerals made abroad, where the dollar credits it would make available would be of the greatest benefit to the Department's program. The attitude of the President was unknown.

Meanwhile, despite a noticeable slackening during the last few weeks in purchases of foreign copper, demands of conductor fabricators continued strong. Some wire mills were clamoring for August metal, it was reported. Electrical manufacturers generally, with staggering backlogs in most lines of heavy equipment, were counted as continuing good customers in the copper market for a long time to come, in the absence of any greater recession than is now generally foreseen.

47% Increase in 1947 Orders Reported by G.E.

Orders received by the General Electric Co. during the first six months of this year totaled $572,597,000, an increase of 47 percent over the corresponding period last year and 28 percent in excess of the total for the best full calendar year prior to 1940, President Charles E. Wilson has announced.

By quarterly periods the orders received this year compare with last year as follows:

	1947	1946	% Increase
First quarter	$272,539,000	$111,775,000	144
Second quarter	300,058,000	277,921,000	8
First 6 months	$572,597,000	$389,696,000	47

"In 1946," Mr. Wilson explained, "the amount of orders was smaller than it normally would have been since no shipments were made for 9 of the first 13 weeks due to the strike, and since it is customary practice, in the case of certain products such as lamps and appliances, to report as orders only the sales value of shipments actually made in each quarterly period. In the case of other products, however, the amount reported as orders received represents the

COMBINED EXHIBIT—"Seeing is the Biggest Thing in Selling" was the theme of the combined exhibit of the General Electric Lamp Department and 19 leading fixture makers at the First Annual Store Modernization Show in New York last week. Featured were newer fixtures available to store owners for relighting

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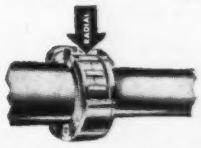
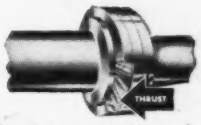
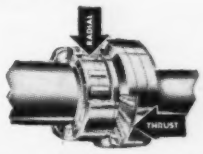


When it's pure radial load, the load bears at a right angle to the rollers.



When the load is pure thrust, it bears at a right angle to the rollers.



When radial and thrust are combined, the two loads are resolved separately at a right angle to the rollers.

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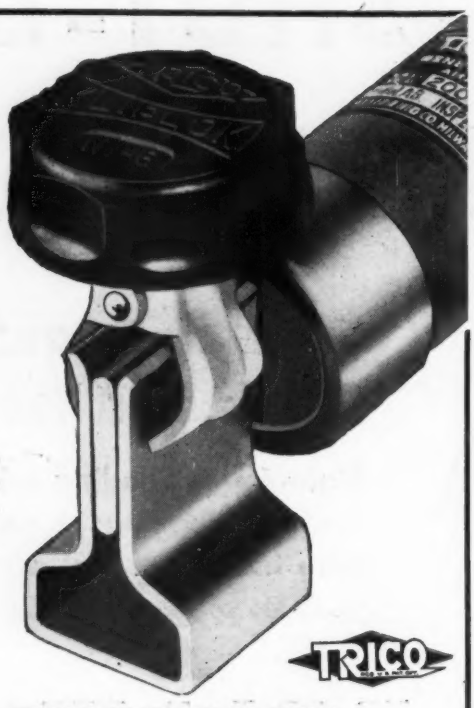

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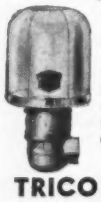

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sales value of new business booked in each period irrespective of when shipment is made."

•

Electrical Manufacturers Cited for Annual Reports

The 1946 annual financial reports of eight electrical equipment manufacturers were cited for excellence in the Seventh Annual Report Survey conducted by *Financial World*: Allis-Chalmers Manufacturing Co., Emerson Electric Manufacturing Co., General Electric Co., Le Roi Co., Penn Electric Switch Co., Reliance Electric & Engineering Co., Square D Co. and Westinghouse Electric Corp.

In the final judging, to be completed by mid-September, one of these companies will be judged as having the best 1946 annual report of the electrical equipment industry, and then will be awarded the bronze "Oscar of Industry" at the *Financial World* Annual Report Awards Banquet at the Hotel Pennsylvania, New York, on October 10. Last year the 1945 report of Westinghouse Electric Corp. won the top award in this classification.

More than 3,500 annual reports were entered in this year's competition, the largest in the history of the series, and 758 corporations have qualified for the final judging in 100 industrial classifications.

The board of judges is headed by Dr. Lewis Haney, professor of economics at New York University, and he is assisted by Glenn Griswold, editor of *Public Relations News;* Sylvia F. Porter, financial editor of the *New York Post*; Elmer Walzer, financial editor of the United Press Association; and Lester Tichy, artist, industrial designer and licensed architect.

•

Philco Sells Battery Unit to National Battery Co.

The Philco Corp.'s Storage Battery Division has been acquired and is to be operated by the National Battery Co. as a consolidation with its Gould Storage Battery Corp. for the manufacture and sale of industrial storage batteries, John Ballantyne, Philco president, has announced. The Gould company will assume warranty and service responsibility for all Philco storage batteries now in use and will have the right to continue manufacture and sale of Philco storage batteries during the transition period.

A. H. Daggett, president of Gould and National Battery, said that with the acquisition of Philco's storage battery

To promote the benefits of planned lighting

Through its membership in the Better Light Better Sight Bureau, Sylvania Electric is one of the three lamp-manufacturing companies participating in the sponsorship of the Planned Lighting Program initiated by the Bureau. This program has Sylvania's whole-hearted endorsement because it will create on the part of business, industry, and the general public, a fuller recognition of the benefits resulting from higher lighting intensities and installations engineered for quality illumination.

Growing recognition of these benefits naturally will be reflected in increased load of a desirable character, and in increased revenues to utility companies.

We feel that the educational material prepared by the Bureau is excellent in quality and comprehensive in scope. But this material is of no value until it is adopted and distributed by the power companies for which it was prepared. If your company has not yet reviewed this material, your Sylvania representative will be glad to go over it with you. For your convenience in arranging an appointment, the addresses of our Division Offices are listed herewith. Please feel free to call upon them for a presentation of the Planned Lighting Program at any time.

Sylvania Electric Products Inc.
500 Fifth Avenue, New York 18, N. Y.

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Boston 9, Mass.

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421 Jackson Bldg.
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Cleveland
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Cleveland 14, Ohio

Detroit
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Detroit 2, Mich.

Kansas City
2109 Broadway
Kansas City 8, Mo.

Los Angeles
210 West 7th St.
Los Angeles 13, Cal.

New York
500 Fifth Avenue
New York 18, N. Y.

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Philadelphia 7, Pa.

San Francisco
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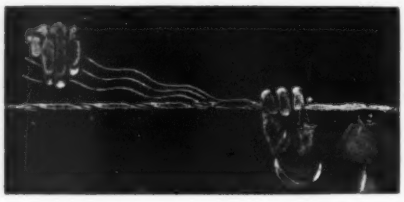

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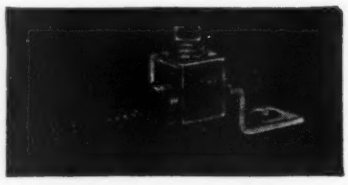

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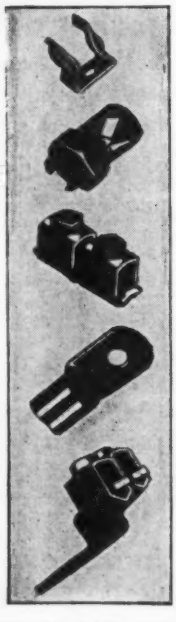

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plant, "Gould and National Battery have manufacturing plants at all strategic points through the United States."

•

Business Volume Will Affect Present Price Maintenance

Stewart-Warner Corp. may have to increase its prices to its customers, F. A. Hiter, senior vice-president, stated recently. Holding that volume rather than materials costs will be the dominating factor in the company's attempt to hold present prices, Mr. Hiter said: "For some months, we had to procure materials at constantly advancing prices or in some cases, at 'premiums.' Our large volume has permitted us to absorb these extra costs.

"But," he stated in commenting on expected increases in steel prices, "if and when volume falls off, we will not be able to absorb these added costs. Obviously, if materials prices go up along with decreased volume, such increased costs must be reflected in our prices to our customers."

Mr. Hiter said no adjustments upward are provided on orders now on the company's books.

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Refrigerator Price Rise

Westinghouse Electric Appliance Division, Mansfield, Ohio, has announced a 3.75 percent average price adjustment on its line of refrigerators now in production. The price increase is based on projected production schedules for the balance of the year. The adjustment went into effect on June 30. This minimum increase is in line with the company policy of doing everything possible to hold price increases to a minimum, G. H. Meilinger, manager, household refrigerator department, stated.

•

Form Metal Stamping Firm

The B. & C. Metal Stamping Co., a new industrial firm organized recently by four Atlantans, has started work on construction of a $250,000 fabricating plant in East Point. The company will manufacture electrical supplies, including junction, switch and fuse boxes, and other such items. The company is headed by George W. Beggs, W. L. Huff, Sam Crowe and J. T. Fisher.

•

Galvin Changes Name

The corporate name of Galvin Manufacturing Corp., Chicago, has been changed to Motorola Inc.

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COHRLASTIC 2007* A heat resistant cloth consisting of glass fabric coated on one side only with white silicone rubber to a thickness of .007". Weighs 8 oz. per square yard.
COHRLASTIC 3010* A heat resistant cloth consisting of glass fabric coated on both sides with white silicone rubber to a thickness of .010". Weighs 12 oz. per square yard.
COHRLASTIC 3016* Similar to COHRLASTIC 3010 except .016" thick, weighing 19 oz. per square yard.
COHRLASTIC 3032* Similar to COHRLASTIC 3010 except .032" thick, weighing 40 oz. per square yard.
COHRLASTIC 4008* Similar to COHRLASTIC 2007 except that the reverse side is impregnated with silicone resin. .008" thick. Weighs 9 oz. per square yard.
COHRLASTIC 5004* A heat resistant cloth consisting of glass fabric impregnated with silicone resin. .004" thick. Weighs 4 oz. per square yard.
COHRLASTIC 5005* Similar to COHRLASTIC 5004 except .005" thick, weighing 5 oz. per square yard.
COHRLASTIC 5008—A heat resistant cloth designed for use in domestic ironing board covers and consisting of glass fabric impregnated with silicones.
COHRLASTIC 8016—A radio frequency electrically conducting gasket material consisting of wire mesh impregnated with synthetic rubber. Used for air and oil sealing. .016" thick.
COHRLASTIC 8024 Similar to COHRLASTIC 8016 except .024" thick.

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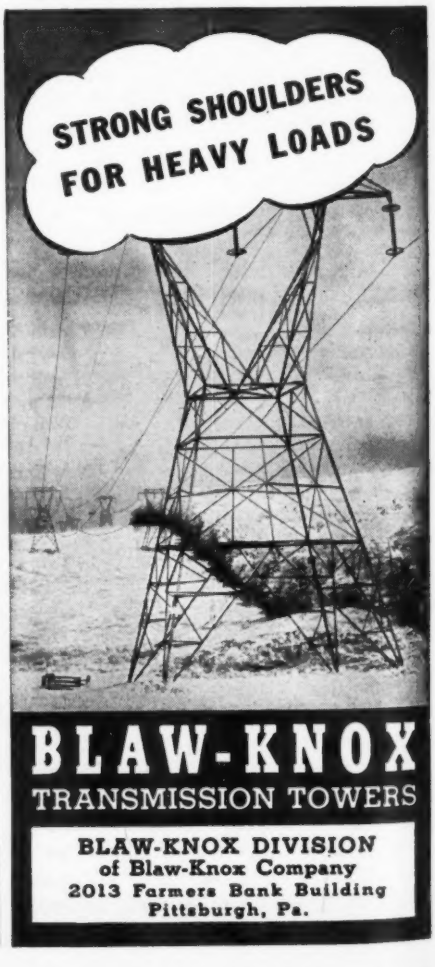

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Recent Rate Changes

UNION ELECTRIC CO.'s new urban residential rate has gone into effect with the approval of the Missouri, Illinois and Iowa regulatory authorities. The new rate, which was the principal feature of a rate adjustment proposal filed with the commissions last month (ELECTRICAL WORLD, June 21, page 118), will reduce the revenue of the company by an estimated $700,000 a year and result in lower charges for electric service to more than 320,000 customers throughout the Union Electric System. As a result, the company and two other business groups in the St. Louis area received the personal congratulations of Mayor A. P. Kaufmann for making voluntary price reductions. The St. Louis mayor told J. W. McAfee, president of Union Electric, and representatives of the other business groups, that they had started "an excellent program, which other people might well emulate."

ALABAMA POWER CO.'s new rate schedule for improved lighting service on streets and highways has been approved by the state Public Service Commission. Under the new schedule 154 municipalities served by the company will obtain increased lighting amounting to an average of about 34 percent, and at the same time have their lighting bills reduced a total of $23,152 a year. In addition to the rate change, municipalities hereafter only have to contract for an initial period of one year, instead of five years, heretofore required by the company. Included are Anniston, 76.9 percent lighting increase at an annual decrease of $148.17; Gadsden, 14.3 percent more light, annual decrease $1,552.39; Talladega, 0.1 percent increase, $778.77 decrease; Pell City, 77.1 increased lighting, $87.82 annual decrease in billing; Montgomery, 34.5 increase, at annual decrease of $973.23; Selma, 12.6 percent lighting increase, $124.33 annual price decrease; Tuscaloosa, 34.3 percent increase in lighting at $724.13 decrease in rates.

WYANET (ILL.) ELECTRIC LIGHT CO.'s new rate schedules that will reflect an annual saving to its electric customers of $2,400 a year, which is approximately 8.5 percent of the company's total revenue from utility service, have been approved by the Illinois Commerce Commission. The reduction applies to residential, commercial and power customers.

PEND OREILLE ELECTRIC COOPERATIVE, Newport, Wash., has reduced power rates under authorization from the Rural Electrification Administration. The rates will be cut from 9.5 to 9 cents per kw.-hr. for the first 40 kw.-hr. and from 1.5 to one cent per kw.-hr. for all over 200 kw.-hr.

•

Prices Cut on Tree Lights

A reduction of more than 24 percent in the price of fluorescent Christmas tree lights, introduced two years ago by Sylvania Electric Products Inc., has been announced by Lewis Gordon, assistant to the vice-president in charge of sales. A string of seven lamps, which formerly sold for $6.50, will now cost $4.95, and the list price for individual bulbs will be 45 cents instead of 60 cents apiece.

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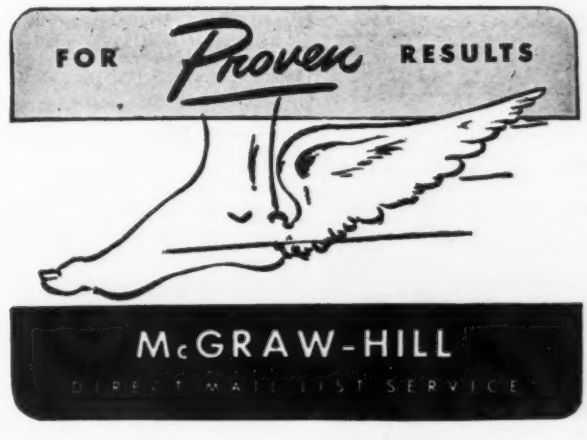

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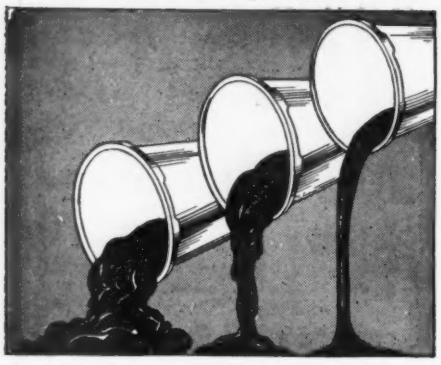

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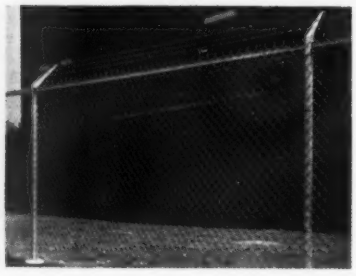

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BOOK REVIEWS

Russian-English Technical and Chemical Dictionary. By L. I. Callahan. Published by John Wiley & Sons, Inc., New York. 794 pages. Price $10.

This is a one-way (Russian to English) dictionary with upwards of 40,000 entries. Despite the dominance of chemical items there are apparently some 2,000 that are specifically electrical terms, as many more fringe words from cognate technical arts and a still larger number of general-language words often coupled with electrotechnical terms. If and when Russian technical literature emerges from the "iron curtain" this lexicon should be of immeasurable help in sensing its import. To help distinguish common terms frequently employed in electrical parlance the author has inserted "elec" parenthetically. The preface is further helpful by commenting on idioms, prefixes, suffixes, word-endings and giving a quick view of Russian grammatical structure.

Electronics for Industry. By W. I. Bendz. Published by John Wiley & Sons, Inc., New York. 501 pages, illustrated. Price $5.

One intent on acquiring a lucid view of the functioning and usefulness of electronic methods in industrial applications can obtain it from these pages. This is the case because the author starts with a practical explanation of the electron, its freedom and its manifestations in current flow in evacuated tubes. From there the steps are luminous emission, the various types of industrial electronic tubes, rectification, amplification, oscillation, modulation and on into induction heating. At this point the basic formulas needed for calculation of coils, power losses and time are given. Closing chapters deal with electronic controls for process timing, welding, etc., with regulator and speed adjusters.

Resistance Welding Manual. Published by Resistance Welder Manufacturer's Assoc., Philadelphia, Pa., 544 pages, illustrated. Price $3.

This is much more than a revision of the earlier adaptation of the 1942 handbook of the American Welding Society because the addition of some 20 new chapters have doubled the contents. An improvement has been achieved by treating the several groups of metals in separate chapters; here is where some of the wartime advances are recorded. Of particular interest to electrical readers should be the extended discussion of the electrical characteristics of welding apparatus used in various ways and on various jobs, including the stored-energy designs. Along with these treatments are new discussions of controls and their effect upon the power supply system. Authoritativeness rests upon the official nature of the book and the talent drawn upon for its preparation.

Servomechanism Fundamentals. By H. Lauer, R. Lesnick and L. E. Matson. Published by McGraw-Hill Book Co., New York. 277 pages, illustrated. Price $3.50.

In no sense an exposition of the commercial forms of servomechanisms, the treatment is rather that of underlying principles and the mathmetical methods for designing and analyzing their functioning. The progressive series of analogies in the early chapters are particularly helpful in appreciating the classifications and terminology of the servo expert. Emphasis is upon the damping, the errors, the stabilizers and upon the transient analysis. In

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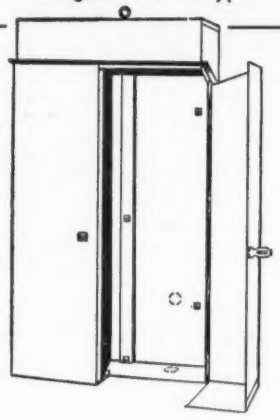

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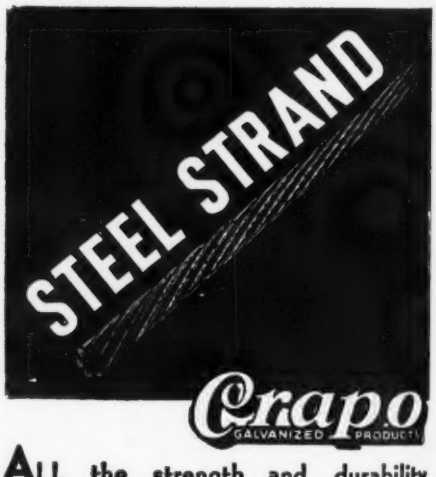

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the latter category the approach is essentially that of Hazen, Brown and Weiss in coordinated, condensed form. The mathematics is no more intricate than differential equations.

Six-Place Tables. By E. S. Allen. Published by McGraw-Hill Book Co., New York. 232 pages. Price $2.50.

This 7th edition has the natural logarithms and the exponential and hyperbolic functions extended to the six places previously shown for circles, roots, common logarithms, trigonometrics, etc.

LETTER TO THE EDITOR

Dubious on Free-Stream Breaker

To the Editor of ELECTRICAL WORLD:

I have read with great interest your account of the tests made by the engineers of the Bonneville Power Administration on a German 220-kv. air-breaker of the free-stream type. I note with much interest that it is hoped to eliminate the weaknesses revealed by the tests and to produce a breaker which will be competitive with the oil circuit breaker.

Although I cannot claim to be a circuit breaker expert, I have extensive field experience with high power circuit breakers, and a reasonably close acquaintance with modern circuit breaker development. It seems to me that the free-stream breaker has a fundamental weakness which will be difficult to eradicate. This weakness lies in the fact that the arc cannot be extinguished until it is rather long. With a long arc the difficulties of control and extinction arising from the large amount of arc energy appear to make it impossible to guarantee consistent performance, such as is attained with the confined arc airblast breaker.

In a visit to Germany in 1945 I saw many breakers of the type you describe, and there was evidence that the number of circuit breaker failures was rather large. In fairness to the German engineers it must, however, be stated that the conditions during the war as regards maintenance must have been of altogether exceptional difficulty. On the other hand, I have heard it suggested by German switchgear experts that the free-stream breaker has, inherently, an inferior performance to the confined arc type, which is in line with my initial observation.

I will follow the American developments with keen interest.

Yours faithfully,
C. W. Marshall
Central Electricity Board
London, England

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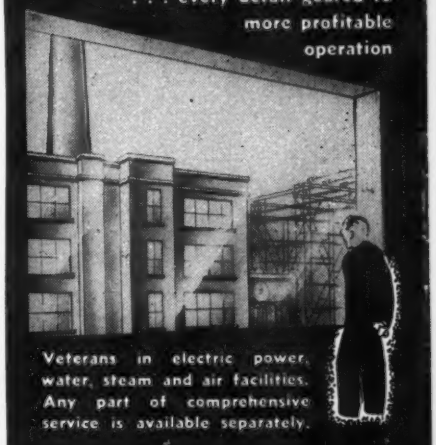

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